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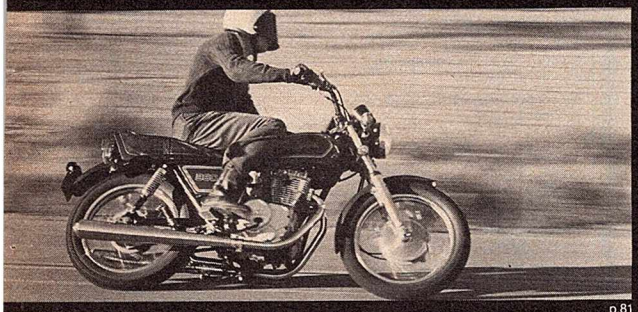

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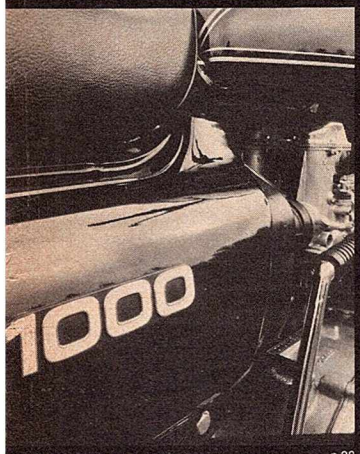

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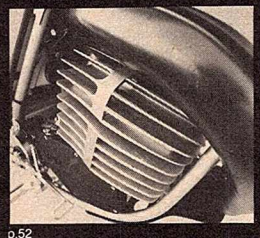

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This Month's Cover: Alone on a deserted California highway, the new, big-bore Kawasaki KZ1000 represents a great technical accomplishment. It's quiet, smooth—and even faster than it was before. Photography by Michael Going.

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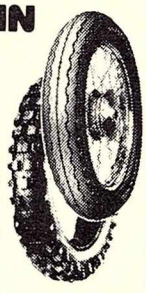

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showroom showdown

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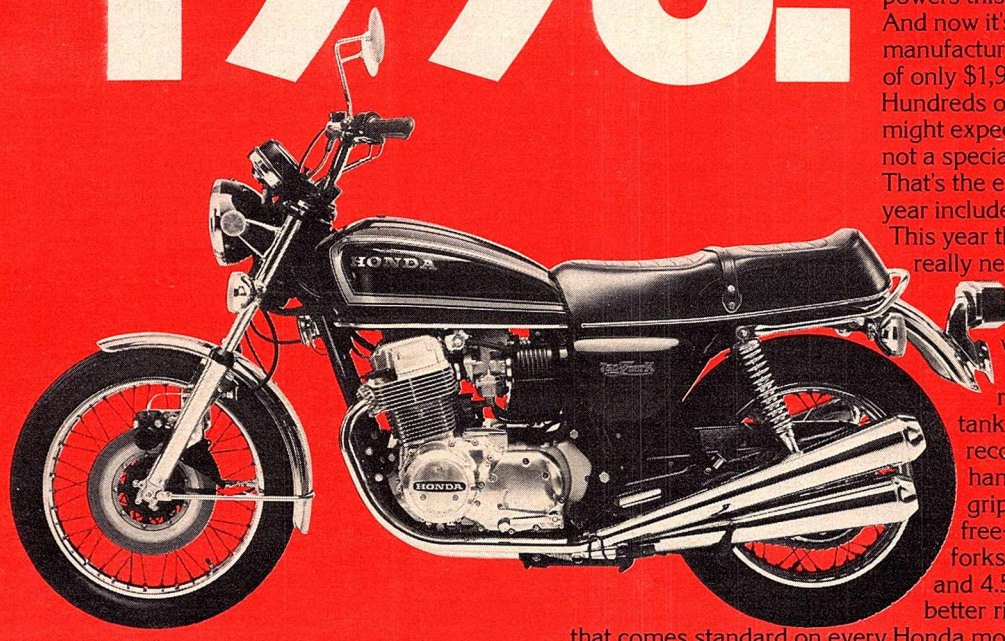


CB-750K The brand-new 1977 CB-750K is a great machine. The eighth-generation son of the first of the modern-day superbikes. An overhead-cam, four-cylinder, four-stroke engine powers this stylish, proven performer. And now it's being listed at the manufacturer's suggested retail price of only $1,998.* That's right, $1,998. Hundreds of dollars less than you might expect. And that $1,998 price is not a specially-reduced sale price. That's the everyday price which this year includes all set-up charges.

This year the 750K has received some really neat performance and comfort changes. Like carburetors equipped with an accelerator pump for snappier throttle response, a new five-gallon tank, four seamless mufflers, recontoured seat and new handlebars with soft neoprene grips. There are exposed-leg, free-valve-type hydraulic front forks, a new 17-inch rear rim and 4.50 cross-section tire for better ride. Plus the one feature that comes standard on every Honda motorcycle—proven Honda reliability. At only $1,998 it's a great way to go. The new 1977 CB-750K has never been better, nor has the time to buy one.

*Manufacturer's suggested retail price includes dealer set-up, but does not include tax, license and transportation charges. All prices optional with dealer. Always wear a helmet and eye protection, keep lights on and check local laws before riding. Model availability may be limited. For free brochure, write: American Honda Motor Co., Inc., Dept. C27P, Box 50, Gardena, California 90247. See Yellow Pages for nearest dealer. © 1977 American Honda Motor Co., Inc.

going strong in the showroom!

HONDA

Editorial

Some Awards They Missed

● THE AMERICAN MOTORCYCLIST ASSOCIATION held its annual award-presentation ceremony early in December, honoring dirt-track racers, motocross racers, road racers, National Championship contenders and sundry industry captains who have made the AMA, and our sport, what they are today. But it an attempt to recognise these movers and shapers I think that the AMA neglected the accomplishments of some other, equally-important motorcycling stand-outs who have impacted our sport and consequently should have a chance to stand up and take a bow.

The Equity Funding Award: Presented here for the fourth time, the EFA this year goes to Louisiana-based Dyron Dilley, whose net profits soared during fiscal 1976 more than 70% higher than during the preceding year. His secret? Dyron promotes a product called "Nuts-2-U," a packaged selection of hard-to-find fasteners for which no-one has any possible use. They go for $7.95. Dilley receives your order in the mail, tears it up, deposits the money and spends a lot of time in Miami Beach. Fraud? Not a bit of it. Since you couldn't possibly use his fasteners anyway, why should he send them to you to clutter up your toolbox? Congratulations, Dyron, for the concept of the year!

The Cheaper Chopper Prize: While we were in lovely Monterey, California conducting a Comparison Test we had a chance to visit one of the local dealerships. Parked outside was a two-wheeled monument to American ingenuity, thrift and that invigorating pursuit of the better mousetrap. Lionel Trayne's Honda CB350 chopper had solved the custom-builder's traditional problem of making a rigid rear end using standard components. How? He had simply removed the shock springs, leaving the rest of the shock intact, and in place. Imagine! And the idea had been there all along. Nice thinking.

The Big Daddy Amin Silver Prod With Fig Leaf Cluster: Presented every election year to that authoritarian individual who creates the most difficulties for the largest number of people who need help, this year's "BDASPWFLC" goes to noted AMA referee Reinhold Dottson. Dottson won his award at Daytona 1976 when he caused the entire Novice field to collapse in tears on the starting grid Thursday afternoon of Speed Week, and then fomented a murderous rebellion among the first-year Experts which reached such a fever pitch that Dottson, in fear of being ridden out of Daytona on a connecting rod, fled to Baltimore in exile. "What those people don't understand," Dottson explained as he was flogging a geranium, "is that I do this for fun, not money. Ya get whatcha pay for.

"Yeah, I'd be King of Scotland, if they wanted me."

The Ring Lardner Award: In recognition of his virtually bottomless reservoir of excuses and alibis, the Ring Lardner Award goes this year to Stan ("The Flogger") Poltroon, a noted AMA road race specialist whose reasons for getting beaten regularly during the '76 season reached new and inspiring peaks of rationalization. Some highlights: "The mechanic put the wrong kind of air in the tires." "My sponsor overslept." "The fork springs weren't chrome-plated." "Somebody stole my Twinkies." "My mother's favorite cat ate all the decals, and threw up." And the award-winner: "My pet chicken died."

The King of the Canyons Scroll: Frank Rash limped off with this year's KCS, and deserved it. His accomplishments: in July, Frank was racing down his favorite twisting road one afternoon and ran over four dogs in one six-mile stretch. Later the same month Frank hit some dirt, skidded, crashed and watched his flaming café racer plunge through the roof of a convent in the valley below, scattering nuns in all directions and setting fire to the robe of a visiting Protestant minister. Hailing a passing motorcyclist for assistance, Frank seized the controls halfway down Racer Road and threw the Good Samaritan's Harley 74 through a hedge row, impaling three grazing sheep on the 74's front fender emblem and causing the bike's owner to yelp, "But we don't ride these bikes like that." Exiting through the same hedge row hole they entered, Frank & Friend subsequently plunged through a passing assembly of nursing mothers and into the side of a police vehicle. Picking himself out of the back seat of Officer Moron's Nash pursuit car, Frank said, "Boy, ain't motorcycling great?"

The Roger Blear Perserverance Cup: Given in the name of that famous long-distance touring rider, Roger Blear, who literally died of boredom near Tucumcari, New Mexico after attempting to complete four non-stop transcontinental rides aboard his Ariel, the Blear Cup this year is presented to Drowse, Alabama's Eileen and Verrazano Narrows who, in the space of ten days, rode their BMW R69US between Browse and Pell City no fewer than 50 times, setting a state and regional ennui record that'll be difficult to top. Upon reaching Pell City for the fifty-first time, Mr. Narrows was heard to ask, "Which way to Browse? Who knows the way to Browse, for Chrissake? Eileen, where's the map?" In her spare time on the passenger pillion, Mrs. Narrows knitted a pair of sneakers, engraved her favorite recipe on the head of a pin and thought up 100 fun things to do with a collander.

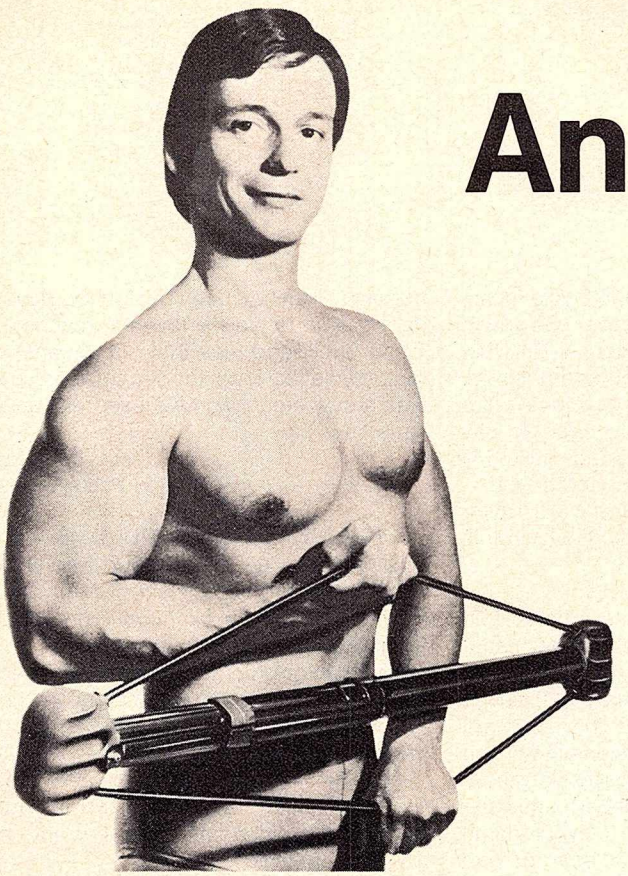
The Little Bighorn Massacre Medallion: Shoving aside contenders like Yamaha (for the OW-31 road racer), Suzuki (the RG-500 Square Four) and a handful of other hopefuls, the clowns at Pabatco (Marvin Foster, Ed Chesnut, Jim Gentry, Scott Hudson, *et al*) ripped off the '76 Massacre Medallion by inviting *Cycle*'s Dirt Donks to lovely Anathema, Oregon for some peaceful trail-riding. They didn't tell us about the bears, rattlers, Ryan's Grave, blind drop-offs, gorges, vertical ascents, washouts, avalanches, forest fires or falling timber. Thanks, you guys. Thanks a lot. Don't think we're going to forget it.

The Annual Salute to Bureaucracy in Pursuit of Honest Profit: For the fourth consecutive year the Salute in 1976 went to Dodo Motor Co., Ltd. of Japan which, for the fourth consecutive year, produced a motorcycle identical to the previous year's, except that *no parts are interchangeable!* Going a step further out of respect for our country's Bicentennial Celebration, parts for the 1977 Dodo will be back-ordered until July of this summer.

Balloting for the Salute went right down to the wire, however. Strong competition for the award came from Meretricci Meccanica, in Italy. All parts for all Meretricci models are interchangeable, all right. But none have been available since 1968, a new record.

Could it be that there is more than one true Dyron Dilley?

—Cook Neilson



An expert tells you how to get back in shape!

Our files show that thousands of men want to get back in shape, but don't know how to go about it. We decided to ask an expert, Mike Fretault, leading fitness authority. Here are his answers.

Q. How can I get back in shape?

A. There is only one answer to that: get more exercise.

Q. Won't sports do the trick?

A. Sure, sports are great, provided you practice a "complete" sport like jogging, swimming or rowing a few hours every week. Unfortunately, most men don't have the time or energy for that.

Q. How about calisthenics?

A. Also very good, but even a beginner's program should comprise at least 200 to 300 repetitions. Most men find calisthenics tiring and boring and give up after a few workouts.

Q. Isn't there an easier way?

A. There is one outstanding home training method I use and recommend. It's fast, it's easy and it keeps you interested because during every workout you actually see your strength increasing on the built-in Powermeter gauge.

Q. What's it called?

A. Bullworker® training. It's based on Isometric techniques which have been proven to increase strength three times faster than conventional methods.

Q. How long does it take?

A. The introductory "get back in shape" program requires only 70 seconds of exercise per day. The complete advanced training program takes about 5 minutes.

Q. What kind of results can I expect?

A. After 2 or 3 weeks of introductory training, most men can see an increase in strength of around 10% and measure an extra inch or two of muscle on their shoulders, chest, biceps—and an inch or two less flab around the waist.

Q. But it's hard work, isn't it?

A. Absolutely not. Most men between 15 and 65 in good general health can run through the full program without getting tired. Bullworker training is progressive so you perform better each time, yet the training always seems easy to you.

Q. What can I expect from continued training?

A. The sky's the limit. There are specialized exercises for building-up or trimming down any part of your body you want to: broad, muscular shoulders —bulging biceps, powerful wrists and forearms—a deep, manly chest tapering down to a flat, trim waist—muscular thighs and calves. You can expect strength increases of up to 4% a week; that's 50% in just three months and I have seen many men go on to double and even triple their strength.

Q. How can I find out more about Bullworker?

A. I suggest you write for the Free Booklet in color. It contains complete details about Bullworker training and tells you how you can try a Bullworker for two weeks in your own home without cost or obligation.

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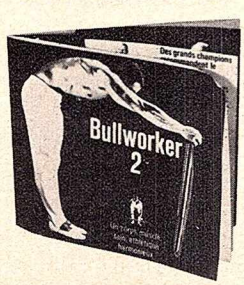

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Letters

How High Is Up?

I'm not sure if you people are aware of what's going on in the rest of the world (in some parts) when you complain of the price that motorcycles have.

There are no Honda, Kawasaki, Suzuki, Yamaha, or Norton-Triumph dealers in Argentina. All we have are Gilera and Zanella dealers, and the biggest motorcycles they make are 180cc. Gilera only makes one model which was known to you as the Gina. Of course you can get an import but (hold on tight) these are the U.S. prices: Honda: GL1000—US $12,000, CB750 K6—US $10,000, CB550—US $8,500 Kawasaki 900—US $12,000. I just sold my 1973 Honda 750, with 20,000 miles on it (in not so good condition) for US $7,500. A 400X18 rear tire goes for US $100, an oil filter for my Honda goes for US $20 (if you can get these parts, which is very difficult).

Enrique V. De Dominicis
Beccar, Prov. de Bs. As. Argentina

CLARIFICATION

RE: Picture of Patrick Evans on P. 81 of your December issue; the caption below the photograph states that the TZ750 Yamaha that Evans is seen riding belongs to Don Vesco. Let's clarify this issue once and for all. The machines that both Pat Evans and Kevin Stafford ride are owned, tuned, maintained, and prepared by Paul Dahmen. Paul's diligence and perseverance in the "privateer" aspect of national road racing has done much to further the sport in the United States and although Don and Paul are, in a sense, partners, we feel it only fair that Paul Dahmen receive equal recognition for his efforts.

John Biehl & Bruce Kochsmeier
San Diego, California

SPONSORS

Your Editorial on sponsors last month (November issue) is appreciated and encouraging to my colleagues and me at Champion. One might infer from your opinion, which we share, that there are many—rather than two—sides to a coin.

James H. Young, Manager
Special Promotions and Events
Champion Spark Plug Company
Toledo, Ohio

BROWNE

Every time I get ready to quit motorcycling altogether in disgust and terror, on account of everybody else on the streets is trying to kill me, and am even contemplating the yet more extreme measure of letting my subscription to *Cycle* lapse, you come up with another Goodwin Sands story about Sir Thomas Browne. Thus you keep me hooked and helpless. And this time the pictures alone were almost more than I could bear, to say nothing of the inimitable Sands style. My compliments to Mr. Sands, and to you.

Ray Ward Taylor
Arlington, Virginia

HEAVY TRUCKIN'

I thought that it was about time I told you guys what I think of your rotten magazine!

I've been reading (and saving) it since I started riding bikes in '69. This summer I put all my worldly possessions in my van and moved west. These possessions consisted of one TZ250 (ex-Baker), one Dunstall-Norton and 3 boxes of your damn magazines that I couldn't bear to part with! Damn it! I can't seem to throw any of them away!

R. A. Bump
Endako, B.C.

LOOK, MA!

Hopefully the "Motorcycle Experience" safety film (*Cycle* 11/76 pg. 90) doesn't include the shot of the cameraman in your article. His "look, Ma, no hands, and no helmet!" attitude isn't very safety-conscious.

George A. Marzelli
Bryn Mawr, Pennsylvania

A BIT TIGHT

Thanks for your article, "Top End Rebuild." I've been trying to convince people of your ideas for years.

One question. Don't you mean .0016–.0018" in reference to the TZ750, and not .00016–.00018"?

Truiett Weaver
Jefferson, North Carolina

Yes. —ed.

HERE'S TO RUSS

After reading the *Last Whistle Stop* in your November Bits column, and failing to catch the article about Russ Collins in your August issue, I felt I owed a great man and a great machine a last salute. Russ and his triple was the topic of more conversations with the guys at the local pizza joint than anything else. Every month when the motorcycle magazines came out, we crashed the stands to find out how Russ had done that month, and if for some reason he didn't win, we felt like our own bikes had been beaten. So Russ, here's one to you and your machine. Good Luck, and may that big Japanese motorcycle factory in the sky smile on you with a new mount and we'll see you next season.

Bill Kolb
El Paso, Texas

BATHTUB RING SYNDROME

Just picked up my husband's copy of *Cycle,* read one paragraph of Rich Taylor's "Terror in the Midnight Rain", and put it down with tears in my eyes.

My husband has raced and wrenched everything from mud scramblers to formula cars. When your magazine arrives, I lose him to the bathtub where I re-discover him hours later, steamily ensconced in a tub of tepid water with your magazine poached and thumbed into a pageless amalgam of goo.

I have often wondered if there is something about *Cycle* that encourages his penchant for cleanliness and the Bionic Housewife's dream, gritty bathtub rings. This month I was lucky enough to snatch up and read your magazine in its virgin state.

From my viewpoint as a writer, every photograph, blurb and article was impeccable. The amazing combination of readability, action, awareness and artistry is to be found on every page. *Cycle* is a publication I would hold up proudly to compare with any of the national slicks.

Thank you for reaffirming my belief that the motorcycle world is not solely comprised of gearbox-crazed illiterates. Even for those of us who never race, who spend our weekends filling gas tanks, timing laps and flashing pit-stop boards, Richard Taylor told it for us:

". . . there is nothing, *nothing* so fine as a racetrack on a sunny Saturday morning. *Race Day*."

Julie Premo Boothby
White Rock, B.C. Canada

MISSING THE POINT

Have you guys been watching a lot of Star Trek lately? I mean NEGATIVE ETs!! Far out! I am referring to your article, "How Quick Can It Really Go?", in the November issue. I calculated for my Norton an ET of *negative* 6.6 seconds. That means I arrive at the end of the strip 6.6 seconds *BEFORE* I started. And any bike (or lawnmower) with more than 1.11 BHP can have a negative ET. Is this dimensional travel or just further proof of the "Big Bang" theory?

Seriously, I enjoy your magazine and the fine articles by Mr. Battersby with all the nifty equations. But I think the proof readers missed the decimal point in front of the 18.

$$ET = \frac{40}{P^{.18}} - 6.6$$

Jim Smith
Lorain, Ohio

Reader Smith, and hundreds of others who noted the same discrepancy, are absolutely correct. Our apologies to them and to Battersby, who had it right on the original. —ed.

After reading Ray Battersby's article "How Quick Can It Really Go", I had to write regarding one glaring technical inaccuracy. It is assumed that since the error in an E.T. based only on horsepower is "only" 2.39% on the average, that weight is not significant. However, a quick calculation shows that 2.39% corresponds to 0.33 seconds for a 14-second quarter mile. At the finish line, 0.33 seconds would put you about 45 feet ahead of your opponent, assuming a terminal velocity of 95 MPH. I'll eat my seat cover if that margin of victory is not very significant. Obviously some correction for weight and possibly number of gears is indicated.

Despite this problem, I enjoy your technically-oriented articles very much and take exception to views such as that of Charles Rossi (Letters, Nov. 76) that such articles are esoteric. Perhaps Mr. Rossi is the type of rider who tunes his bike only when it won't do 55.

Don Sutherland
Montreal, Quebec

KZ 650

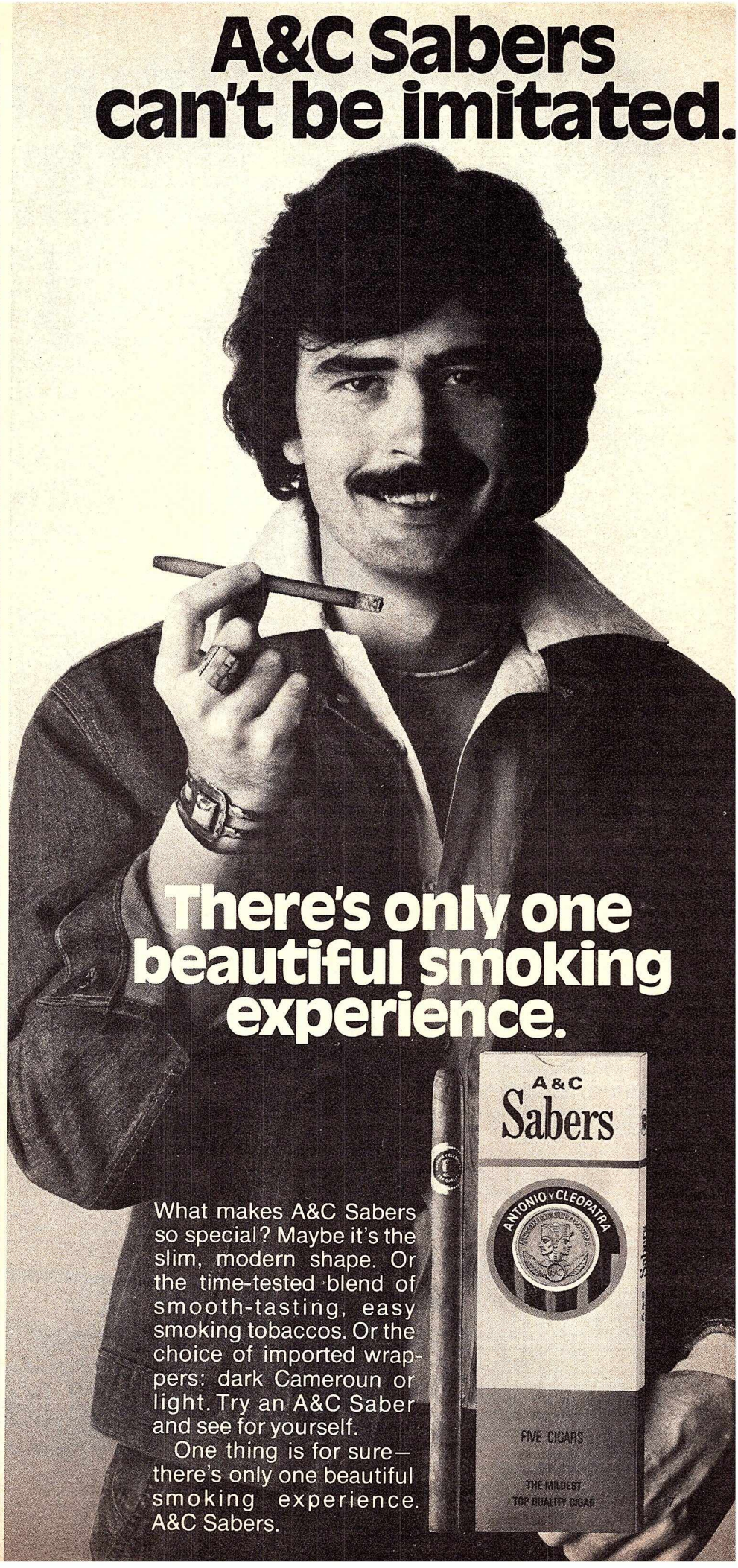
I just read your road test on Kawasaki's highly touted KZ650/4, and was, needless to say, disappointed. Are you guys sure you had all four plug wires connected, or did you test a KZ400 by mistake?

Michael Frey
Lititz, Pennsylvania

How'd you say you pronounced the name of your home town? —ed.

I wish I had a subscription to your magazine so I could cancel it! Anybody who could put out an article like the one you put out on the super bike, Kawasaki

(Continued on page 11)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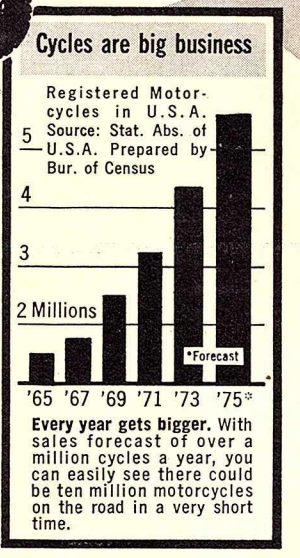
Cycles are big business
Registered Motorcycles in U.S.A.
Source: Stat. Abs. of U.S.A. Prepared by Bur. of Census
5
4
3
2 Millions
*Forecast
'65 '67 '69 '71 '73 '75*
Every year gets bigger. With sales forecast of over a million cycles a year, you can easily see there could be ten million motorcycles on the road in a very short time.

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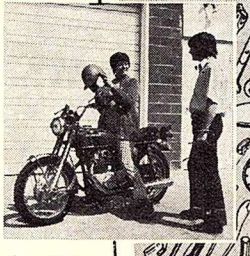
Has your bike ever been out of action waiting for needed repairs? It happens to almost everyone! It seems motorcycle shops just can't keep enough mechanics on hand to take care of everyone. Wherever you go all over this country, you'll find motorcycle shops looking for qualified mechanics . . . and they pay good money too!

Million New Cyclists

Motorcycle sales are going through the roof! The estimate of a million new motorcycles bought this year is probably low—and now with gasoline shortages and higher prices, you can just imagine how many people are going to be switching from automobiles to motorcycles for their regular transportation . . . not to mention the thousands upon thousands of new dirt bike riders who are discovering the thrills of this action-packed sport.



More Girls – More Bikes Each Year

If you've been riding your bike for fun the past few years, you can see for yourself that more and more girls are taking up the sport. And this means more bikes every year . . . and a bigger demand for motorcycle mechanics. So get in on the action . . . get in on the fun—start making good money as a motorcycle mechanic. Rush the coupon today for free facts – full information.

You'll Be the Center of Attraction in Your Circle of Friends . . .

Enjoy the admiration of friends and neighbors as they flock around to watch you tear down and tune up all kinds of motorcycles. And just think of the satisfaction in knowing you've got the best performing bike in town. Plus, you can make extra dollars fixing motorcycles for friends and neighbors.

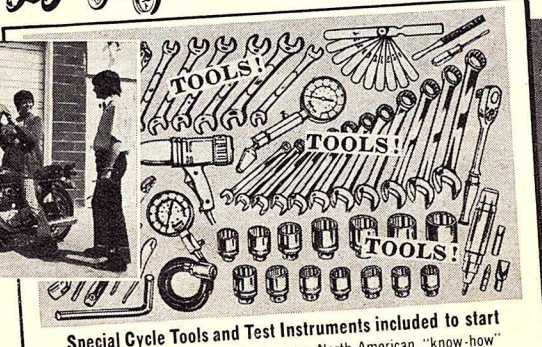
You Get the Tools You Need for a Fast Start

We send you the special cycle tools and test instruments you need. This set of precision tools is yours to use during your training . . . and yours to **keep** in your action-packed career. You actually learn by doing—with the tools in your hands—getting the practice you need to become an expert motorcycle mechanic.

Everything is explained in easy-to-understand language, complete with drawings, diagrams and photographs. You'll learn engine design, carburetion, electrical systems . . . as well as how to adjust and repair frame, wheels, shocks, transmission, valves, everything you want to know from routine maintenance to a major overhaul.

Work Out of Your Home!

It's easy to get started once you qualify as a motorcycle mechanic. Just let your friends and neighbors know you're ready to repair cycles in spare time—or if you'd rather, get a full time job at a motorcycle shop or dealer.



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Your future as a motorcycle mechanic is in your own hands. The big demand means you can decide for yourself whether you want to work for someone else or get into your own cycle repair business. Start in your spare time repairing cycles for friends and neighbors—or get a job with a motorcycle shop! After you've been a working mechanic, you can decide whether you want to start your own profitable repair business.

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Get all the facts now . . . without obligation. Be the first in your neighborhood to cash in on the big demand for motorcycle mechanics.

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650, has no business even sitting on a bike. That may have been why your article was so poor, maybe you didn't even sit on it, let alone ride it. I'm the proud owner of one of the first 650s to be sold to the general public. My bike apparently isn't anything like the 650 your magazine tested.

After 2000 miles in two weeks I've found out a few statistics of my own. At an average speed of 80 m.p.h. my bike gets 49.8 m.p.g. That's a big jump from the 43.8 m.p.g. you got.

Your riders who couldn't reproduce the 13.14 seconds for 99 m.p.h. in the ¼ mile that Kawasaki and other magazines have gotten, are also incompetent to make any observations as to the bike's ride, handling, and overall performance.

At 60 m.p.h. there isn't any engine whirring that causes me to "nudge the shifter in search of another gear." The only sound I hear is the sweet sound of wind whistling through my helmet.

The only time that vibrations of any kind can be felt in bars, seat, pegs, or anything else is, *ABOVE REDLINE.* On the highway it's super smooth. There is no "telegraphic jarring from freeway seams and ripples."

Once the bike is laid over in a sharp corner you find out that the bike is really great. Superb cornering with excellent directional control, no wobbles from small road defects.

I hope you continue riding the Honda 550 you keep comparing the 650 to. If you do you will never know the joy of riding a really great bike, but with the one-sided attitude you display I don't think you deserve a great bike.

Mike Collins
Robins A.F.B., Georgia

TIRES AND RIMS

Gordon Jennings' recent article on tires and rims was excellent, particularly in stressing how tough today's Superbikes can make tires work. I would like to offer a clarification, however. True, for maximum performance, our recommended rim width for the size 5.10/80-18 K112 tire is 3.00". But the stock rims on many machines, such as the Kawasaki Z-1 2.15-incher, are within the acceptable range for this tire. Many riders report highly satisfactory results and much improved handling with this combination, especially under high loads (maximum load range for this size is 660 lbs.).

Arnold van Ruitenbeek
Vice President, Conti
Rubber Products
Carteret, New Jersey

CLAIMING

After reading Mr. V. Salvatore Emanuele's letter in your December issue, it appears evident to me that Mr. Emanuele does not understand all of the objectives of the AMA claiming rule. The rule is there not only to keep out exotic factory-built specials, but to keep manufacturers honest in making parts available to all qualified riders which were available only to team riders in the past. If manufacturers are putting more than $3,500.00 into their Grand National dirt track motors, then shame on them! Gary Scott is not only striking a blow against the manufacturers for himself, but for every privateer who doesn't have unlimited funds to put into his own dirt track motor. Mr. Emanuele attempts to cloud the central issue through all manner of unwarranted, spurious, and outrageous slurs against Gary Scott, a plucky and courageous rider fighting a decidedly uphill battle. In his tirade against Scott he mysteriously seems unaware that there are conditions written into the claiming rule that effectively prevent any single person from "buying out the competition." His missive reads suspiciously like a H-D poison pen letter, especially considering his state of residence and wealth of information on the subject of Scott's past and present relationships with H-D. Scott isn't the first rider to use the claiming rule, and I hope he won't be the last. Keep 'em honest gang! And as for Mr. Emanuele—Salvatore, go to your room!

L. D. Montague
Norwood, New Jersey

COPY?

Since the introduction of Suzuki's GS750 I have waited for someone to claim that the bike is nothing but a copy of a Z1. In the November issue Glen E. Turnbull obliged and went on to say "the whole basic design and parts are all Kawasaki-designed." Incredible! He deserves to be beaten about the head and shoulders with an SAE journal. That basic engine design has been running around in circles at Indianapolis since 1913. Double overhead cams operating directly on the valves have been used by Offenhauser, Jaguar, Ferrari, Moto Guzzi, MV Agusta, Honda and dozens of other manufacturers. Suzuki used the design for the same reason Kawasaki used it; it works very well.

James A. Miller
Ypsilanti, Michigan

MUSHY ABOUT MUSH

Sometimes a technically excellent photograph is coupled with a dynamic split-second of action and the result is a multi-dimensioned record of a happening. These pictures seem to jump out at you, just like the shot of Gary Nixon that was taken by Mush Emmons. (page 62 Nov. *CYCLE*) All I can say is, "I wish I had taken it. It's outstanding."

Dr. Glenn Freudenberger
Everett, Washington

I felt compelled to let everyone know how much one reader-viewer loved Mush Emmons' efforts in the Laguna Seca arti-

(Continued on page 43)

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The Duct Tapes

No Doubt About A Bow

We would like you to meet Ed Hertfelder. We don't know who he is or what he does. We do know that he habitually rides Eastern enduros, and just as habitually falls off and damages himself.

Over the years he has periodically damaged himself with some severity. When that happens he consoles himself on the typewriter, and his digital therapy has produced some of the funniest prose ever to appear in this or any other motorcycle publication. A few weeks ago he sent to us a flight of fancy concerning the attempt by one of Ed's mythical friends to put on an international six-month trial, the result of said attempt resulting in a police car filled to the window-winders with fire-hose water, a Japanese rider killed by a Bultaco wheel spoke and stuffed into a refrigerator and several other forms of lunacy. The piece was so long we couldn't possibly publish it, so we invited him to do a monthly column for us instead. He asked us to tell you that he is the worst Mediumweight B Rider in the East Coast Enduro Association. —ed.

● ANYONE WHO HAS RIDDEN A MOTORCYCLE more than seven minutes can tell a hair-raising tale of avoiding an unpleasant immovable object by merely breaking all the laws of physics. All of us know turkeys who can describe incredibly close calls, in excruciating detail, for the better part of a forty-hour week; at which time the listenee is wishing that the next case of the big eyes would cost the bird a section of artery, preferably from the larynx. Most of us would rather forget the close ones. They indicate poor judgment, ineptitude, and suggest the possibility of having more verve than brains. The closest call I ever had could have been easily avoided and I'd like you to know about it.

They asked me to help Woody lay out the Curly Fern Enduro because he was having his semi-annual hypochondriacal seizure of pages 177 to 226 inclusive in his Home Medical Dictionary. Goiters of the ear, bursitis of the eyelids and ingrown nostril hair, Woody knew how to suffer; you name an ailment and Woody either had it or was developing it. Once a doctor diagnosed a strep throat and advised Woody to drink lots of water which Woody claimed washed the strep down and gave him a strep stomach.

Woody had the basic layout done; he was getting his mileage and checkpoint placement by rolling one of those gauges with a little toothed wheel over geodetic survey maps. In the interest of making his maps lighter Woody had scissored out places he could not, or would not, route an Enduro; Fort Dix, Lakehurst Naval Air Station, Hammonton, various bird sanctuaries and camp sites, and burned-over places that were still tender. The maps looked like seat covers for a two-door Chrysler Highlander.

This butchery aside, Woody would fold his maps into four-inch-square packets, stuff them in his hip pocket, then hammer his Sachs down Hampton Furnace road which has 410,000 stutter bumps per mile and looks like a strip off a large golf ball. After five miles of this the map would be as flat as a fried egg sandwich, the texture of fine linen and so terminally mauled as to be immune from further damage. Unfolded, the map now sported white lines four inches apart where the ink had flaked off and was easily mistaken for the aforementioned Tartan plaid seat covers. Naturally, Woody's little wheel would meander across a white line and there would be an acre of UNEXPLORED territory to be checked out to see if two hundred motorcycles could cross the area without losing any. That's why they called me.

I was going through a period when I felt I could take a motorcycle *anywhere*. I'd come to a bog and catch second and either motor out or mire, and I enjoyed one as much as the other. Nobody would ride with me; they got too tired pulling me out of the muck I'd drive into. I might hesitate at the Atlantic Ocean but would certainly try the Cheasapeake Bay if I could find someone with a rowboat to carry my Gatorade and malted milk balls. For awhile there I planned a cross country run, from coast to coast, with no deviation from a straight line; hauling the motorcycle up the front of buildings, riding it across the roof then lowering it down into the back yard then up and over the fence. One straight tire track all the way.

I had pulled the headlight off my Bultaco, and mounted in its place a winch of the type usually found on the pointy end of boat trailers. I wound the thing with surplus nylon line that, I believe, they used to tow gliders. It wasn't the best for the job but it was the cheapest, a quality that overlooks many faults. Usually I'd stick the Bul in a bog third fin from the top, tie the line to a pine tree then crank in a half ton of pull. The bike would begin making erotic sucking noises then, "twangg" she'd fly out with me holding onto the rear shocks and don't those suckers pinch if you run over a log? One time I tied onto a cedar tree that had been lightning-struck; it ended in a charred point twenty feet high but it was solid lumber. I cranked the winch until the line was humming in the breeze, but the motorcycle sat there like a monument. I gathered up a few more ratchet teeth by clamping my twelve inch vise grips to the winch handle when the unbelievable happened, believe me. Instead of going "twangg," it went, "ggnawt" and the tree would have punched me twelve feet into the mud if it hadda hit me. Cedar roots are shallow and wide-spread and the tree tilted up with a huge circular divot of tundra on it's roots. It looked like a big thumbtack.

The winch was fine but too slow.

Trying to let my engine drive the winch I designed a jackshaft running from side to side under my gas tank, a chain on one side dropping straight down to a doubled countershaft sprocket and a pulley on the other side with a V belt to the winch. The idea had merit but I couldn't decide if I wanted to ride a winch-mounted motorcycle or a motorcycle-mounted winch. Then I spent three evenings trying to devise a way to start the Bul's engine backwards. I had in mind hose clamping the front brake on, lifting the front wheel and walking the thing out of bogs like a motorized wheelbarrow. Finally I drug the hundred and fifteen pound barbell out of the attic and began lifting. If you really work at the iron you can lift the back end of a two fifty all day Sunday and while you may be panting hard enough to inhale mosquitoes and terrify small birds, you can still get out of the car unaided when you get home. Monday morning, of course, is a bitch. Personally I've found it best to crawl out of bed backwards, get the knees on the floor, do a push-up off the bed to get the back vertical then pull yourself erect hand over hand up the bed post.

A good bullet to bite on is a .45-70. and the best thing for getting a motorcycle unstuck is four guys with a total weight of 800 and a total age of 80.

Three of Woody's questionable sections required construction. A deep creek crossing was bridged by a ladder-type bridge of 2x4s that I dragged in behind my motorcycle. The other two were bogs that would be rideable until the first idiot panicked into low gear. They found someone to jeep in pallets to floor the bog, but this idiot left them in plain sight near a road. I sweated the things into the brush before the weekend campers saw them. I'm convinced that campers will burn the last fragments of the True Cross if they could

(Continued on page 107)

ACCESSORIES

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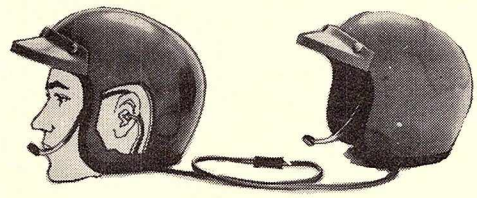

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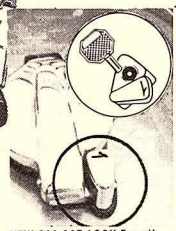

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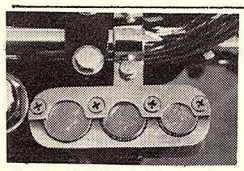

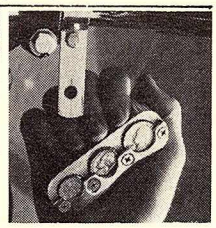

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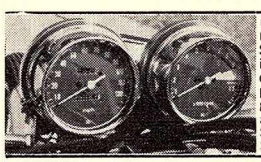

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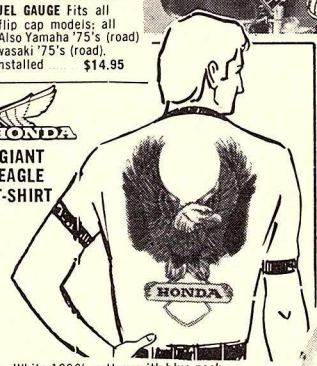

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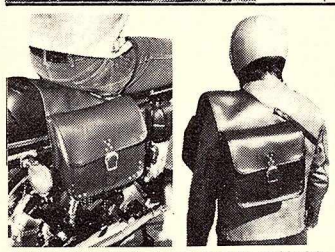
		#972	w/Sissy Bar **$30.95**
		#974	w/Wndshld **$30.95**
		#976	Sissy Bar & Wndshld **$34.95**



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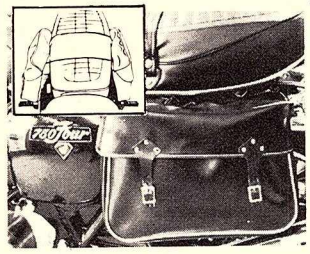

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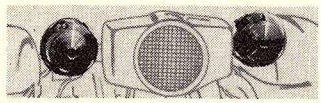

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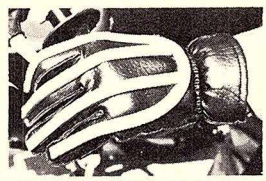

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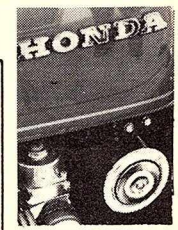

MINEOLA MAX HORN Ear-piercing sound from chrome-plated high output horn. For safety, replace your original horn. Fits all Hondas and other bikes ... **$11.98**

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MINEOLA TOURING SEAT The ultimate! Maximum comfort, tops in style. Covers helmet holders and wires on late model bikes. Black or Dark Brown. **$84.95**
Also available with 14″ steel reinforced back. **$99.95**

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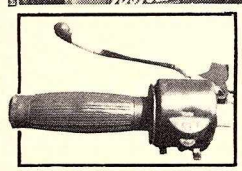

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Tips

Blackened Jacket

My *girlfriend* had a complaint about my Kawasaki 900. The drive chain threw off dirty oil, and the stock chainguard didn't block the dirty chain lube from being thrown onto the back of her jacket.

The cure to the problem is to fit a chainguard from the 1977 Kawasaki KZ650. It bolts right on all 900 and 1000 Kawasakis from 1973 to 1977 and completely shields the rear of the chain, preventing any muck from being thrown onto the back of the passenger's clothing.

David Jacobson
New York, New York

LEAK LOCATING

I accidently came across this idea while fixing a flat on my bicycle. Unsure as to where the leak was on my innertube, I figured I was going to have to go through the "dunk it in water and watch for the bubbles" routine. Instead, I put enough air in the tube to keep it from looking limp, and started spraying the tube with an atomizer (something like the new bottles Fantastik comes in). Little did I know, but there had been some laundry detergent mixed with the water (I'd used it for its degreasing purposes when working on a car engine). Well, when I sprayed the stuff on the leak, guess what happened? The little devil started blowing nice, *visible* 1" diameter bubbles in the soapy solution. Voila! No more dunking in tubs of water.

One more thing. If you find yourself with a flat, and you're not sure whether it's a bonafide hole or the work of a neighborhood gremlin, try this: with the same atomizer (a paint brush could be substituted) and soapy solution, coat the tire with it—a simple chore with the atomizer. With the tire inflated, most of the time a slight foaming and flowing of soapy detergent will occur at the leak point, provided there is one. If there isn't, and you're not in a rush, let the inflated tube sit for a while to see if it deflates. Meanwhile checkout and deflate your neighborhood gremlins. One caution: I don't know of any, but there may be a detergent which might harm rubber. Tide worked reasonably well for me, and I assume will for you too.

Dan Juilfe
North East, Pennsylvania

HAIRPIN COTTER

It seems that one of the most difficult and time consuming part of adjusting the chain on most street bikes is the removal and installation of the cotter pin in the axle, which has to be coped with before loosening or tightening the axle nuts. Not only are cotter pins stubborn about being removed, but being bent and straightened a couple of times will usually do them in.

Those poor souls who haven't discovered them yet should rush right down to their local hardware or fastener shop and ask for a "hairpin cotter" of the appropriate size. It will look like a giant hairpin: one side goes through the hole in the axle while the other side springs tightly around the nut, holding the pin securely in place. It will directly replace your cotter pin and is safe *and* reusable. One thin dime can save you lots of time!

Dale Jonté
El Ceritto, California

TIRE-MOUNT MOUNT

I'd like to pass a few tips on to fellow bike riders that might make life easier for them.

The first is helpful when it comes to changing tires. I found that if you use a large metal garbage can the rim of the will support the inner part of the tire rim. Since these garbage cans come in different sizes, you will have to measure the mouth diameter to see if they will fit your rim. This raises the tire off the ground and makes it easier to work on.

The second tip mainly concerns dirt bikers. Since dirt bikes come without center stands, it makes for a problem when it comes to working on the front or rear suspension or even lubing the chain. You can buy stands for this purpose but they cost lots of bucks. While walking in a Sears store one day I came upon a sawhorse-bracket kit. An idea came to me and I brought a set for a buck and a half. All you have to do is to supply your own two-by-fours. I measured the distance from the ground to the bottom of my engine frame tubes or skid plate on my RM-370, which was 10 inches. I made the sawhorse 12 inches tall and 18 inches wide. Now working on my bike's suspension I just put it on the sawhorse and raise either the front or rear wheel. At motos or when trail riding where the ground is soft just nail a piece of rectangular plywood to the four feet.

If there is no Sears store near you, any hardware store should have the brackets.

Jack Kunitsugu
Seattle, Washington

SOLAR SHIELDING

Apply Trimbrite "Solar Shield" chrome sunscreening to your clear face shield to give a mirror-like tint to the shield that will reduce glare considerably, just like those polarized sunglasses.

If you want a comfortable glove that is cool to wear, for racing or street riding, try a pair of Nomex racing gloves, available from Auto World, Scranton, Pennsylvania, for $16.00. They have flameproof leather palms and double-knitted Nomex backs. The gauntlet style covers the fore-arm and has a Velcro wrist closure.

You might also want to try a Nomex hood, if you wear a full face helmet. The hood resembles a ski mask, but it is lightweight and comfortable. It keeps the inside of your helmet clean and makes it easier to get on and off. $11.00 from Auto World.

Phil Canada
Melrose, Massachusetts

FOR BMW OWNERS

Here are some tips on BMW's that I've picked up over the last 50,000 miles with two of them. First; changing the driveshaft lube on /5 and /6 models is greatly simplified if you get a small plastic squeeze bottle (like honey comes in) and, after draining the driveshaft completely, just put a pre-measured amount of 90 wt. gear lube in the bottle and squeeze it in the filler hole *slowly*. The squeeze bottle will fit the confines more easily than a funnel and will prevent oil spillage all over your back tire.

For those of you with /5 models, the battery is probably a source of some consternation. Generally they will not last more than two years. However, you can minimize the hassles of a weak battery by investing in a small trickle charger and, particularly if your battery is more than a year old or it is cold out, charge it about once a month.

If your /5 lives out in the weather, you've probably noticed that your thumb switches have greyed. To return them to their original color simply squirt some Armor-All on them. While you're at it, spray it on all rubber components on the bike. BMW uses real rubber instead of synthetics and they will decay in smoggy climates.

For /6 and S models, when you change your front tire be careful of the disc. BMW uses a thin perforated disc which is susceptible to bending if beat against the ground. On single disc models, simply keep the disc facing skyward. On S models lay the wheel on a bucket or waste paper basket padded with a towel to protect the spokes and change the tire from this elevated position. Another thing:

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The TC-205 comes equipped with a one touch recording system. A review function. A built-in condenser microphone. Plus a L.E.D. indicator that does two things. By emitting a blinking light it lets you know when you're recording. By emitting a steady light, it lets you know if the batteries are running weak when what you're recording (or playing back) is going strong.

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The CF-302 comes equipped with the same fine cassette-corder as the 205. Its radio is a sensitive FM/AM tuner. With an AFC switch. And you can use either AC or batteries.

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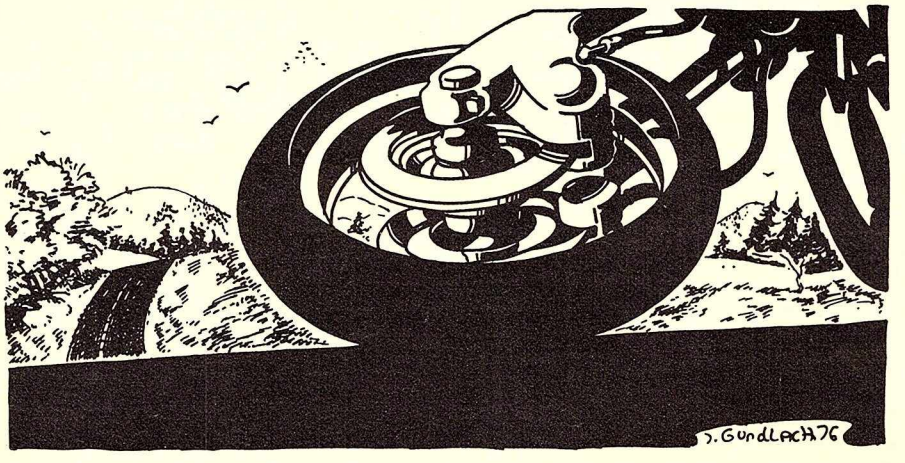
compounds, remained company secrets. Michelins generally ran higher pressures, up to 34 psi in some of the fronts which at first scared a few riders. Without being funny, it's been said that the main difference between Michelin and Dunlop was the RG500 Suzuki. Certainly RG500 road holding improved when Michelin-equipped. For with the Dunlop KR111 fitted there was a tendency for the lower exhaust pipes to ground when cornering hard; the low-profile 3.50/5.75 (3.5 inches high by 5.75 inches wide) tire brought the Suzuki paraphernalia closer to the road. In contrast, the 4.00/5.60 Michelin with a rounder profile and more favorable height/width ratio reduced the grounding problem. Furthermore the Michelin enhanced the 500's suspension characteristics to an extent that riders could notice, if not explain. When the Dunlop would lose adhesion, it started to go earlier and more slowly than the Michelin, giving some advanced warning. The Michelin hung on longer, but when it went the process was rapid. Therefore Dunlops were more predictable and slower, while Michelins turned in better lap times to win races, converts and championships. Michelin superiority could be measured in fractions of a second saved, and in the risky business which is racing, championships turn on fractions.

Michelin produced SV (Sec equals Dry and V equals high-speed rating) rear slicks in two completely different compounds, identified as 9 and 10, molded onto a single type of construction with no variations in stiffness. External conditions on race days governed the choice of compound for any given start, though as a general guide longer races on abrasive surfaces would indicate preference for the 9. Compared with the 1975 version, the new slick adopted a lower profile at 4.00/5.6, filling the gap between the 3.50/5.75 Dunlop and Michelin's own "high" tire. The rounded cross-section provided a big arc of rubber and made for good banking progression, and supplementary shoulders gave increased contact areas at maximum angles of lean. Other advantages were better braking and better traction when just off the upright position. Whether rubber compounds underwent revision at the time of the 1975–76 changes, the average Michelin field man had no way of telling—and could never be permitted to know. The two or three insiders who may have known the Michelin secrets would never say a word. But as a guess Michelin compounds did alter.

Since racing in the rain is an accepted fact of life in Europe (though almost a lost art in the long, hot summer of '76) Michelin carried stocks of PV4 tires, the P and 4 denoting a compound specifically formulated for wet running. Initially hand cut at the factory or race track, the shallow PV4 pattern was later embodied into the production mold. At Fort Dunlop, the same development process resulted in a rain tire with super-soft compound and no provision for dry usage. Dunlop also built soft and medium (usually medium) KR116s, originally designed to satisfy the no-slick rule governing British national meetings. The intermediates proved to be excellent "all-weather" rubbers for big-capacity machines providing race distances were reasonably short and temperatures moderate. In very little time KR116s became GP/F750 issue for races held in variable (damp/cool) conditions, and at times when riders would have favored slicks. Mills and company considered the KR116 the best answer to unsatisfactory FIM rules that empowered appointed stewards to ban slicks at the first sign of a cloud on the distant horizon, to override expert opinion, and to order riders out on unsuitable rubber. FIM appointees felt comforted at the sight of patterned tires, apparently believing they were long-lasting, all-weather equipment. But Dunlop knew the limitations.

In certain circumstances, the patterned variety shed rubber and lost stability when fitted to powerful 500s and 750s. If subjected to prolonged dry running and rising temperatures, heat build-up could increase wear by 30 percent and, more seriously, cause the grooves to distort alarmingly from their predicted pattern.



Rear-wheel steering became a reality. The phenonemon disturbed F750 riders at Assen where 100 miles in the dry overtaxed intermediate capabilities.

For the Finnish GP, where slicks were forbidden, Michelin resorted to the less-than-totally-effective M45-PZ2 "all-conditions" rear tire (a development of the superbike road cover) and gained a victory at the expense of some discomfort to the riders. Although Michelin experimented with TY2 and 4 (different compounds) intermediates, these were not officially part of the range and never became available in any useful numbers. Michelin therefore had a gap between the slick tire and the wet tire, and Dunlop exploited the omission. The KR116 coped comfortably with wet races, dry races and in-between races of GP length, and its attributes encouraged Michelin advocates to turn temporarily to Dunlop. For instance, champions Barry Sheene and Victor Palomo went to 116s for races that started in the cold with a suggestion of rain in the air.

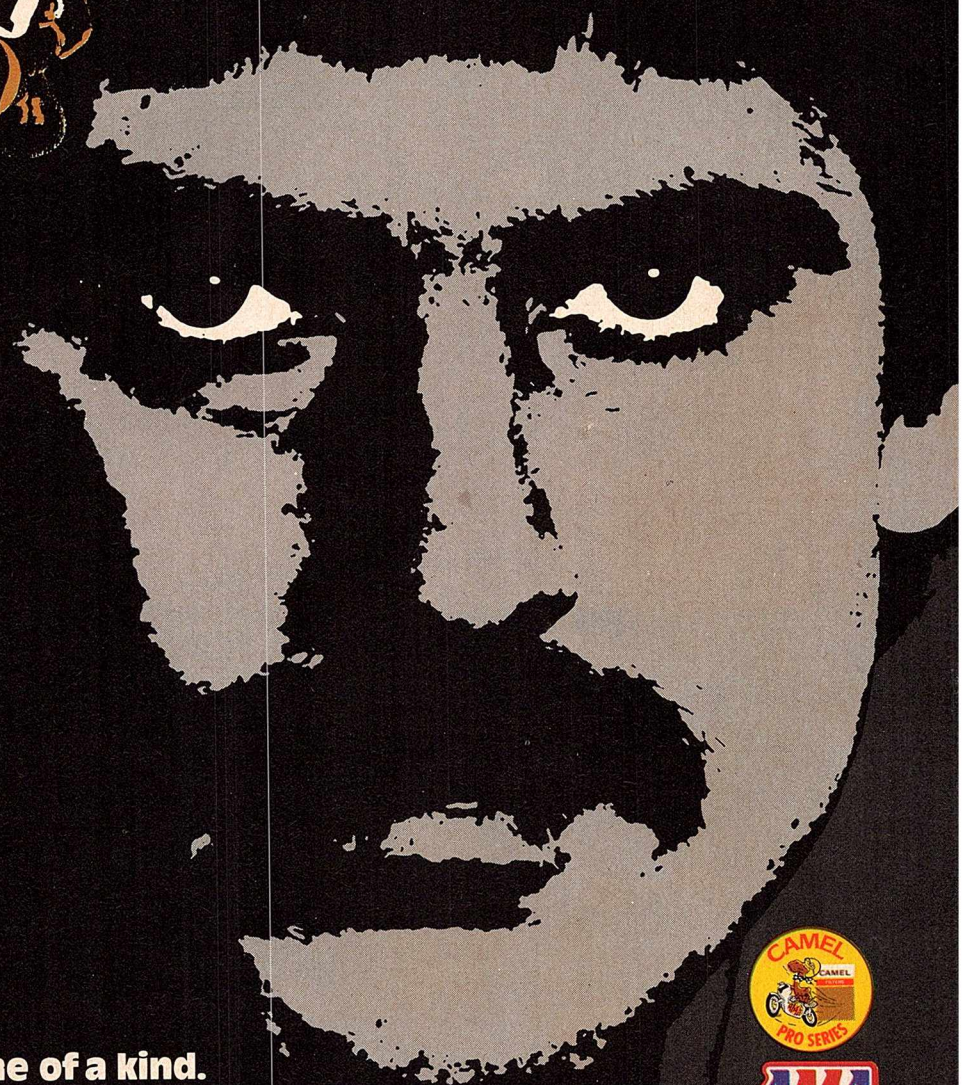
Michelin made no front slicks, seeing no point and receiving few requests to do so. Dunlop did make them, more out of regard for its American customers than to please Mick Grant and other Europeans with front-slick leanings. World championship regulars invariably felt happier with patterned fronts, appreciating the smooth transition from heavy straight-line braking to clean cornering. When on slicks, they complained of chatter, possibly stemming from shear action, and a disconcerting tendency to grip hard one second and ease off the next. Dunlop KR113 ribbed fronts reflected European tastes, being fairly fat (3.25/4.50) and very round in section to further braking efficiency and to provide predictable performance, probably at some sacrifice to the ease of changing direction.

The traditional KR84 with 60–40 percent rubber-to-no-rubber ratio still graced the Dunlop range in the one-compound form its pattern dictated, leaving KR113s to supply variety. Developed from the endurance tire, one-one-threes/(70–30 ratio) were supplied in a choice of four compounds. A somewhat complicated formula covered all known combinations of road and weather conditions and race distances. The "wet" version wasn't just for rain but also was recommended wear for races run on smooth roads and held in cool weather.

Against that range of fronts, the Michelin options appeared positively puny. Michelin offered no front slicks and only one choice of pattern. Another thing was that the Michelin and Dunlop philosophies relating racing to commercialism represented opposites: Dunlop developed road tires from racing experience, while Michelin adapted road tires for racing. With a very fair imitation of the best of British understatement, the French let it be known that: "Our tires are suitable for competition use."

(Continued on page 116)

THE CAMEL PRO SERIES '77



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MAR.	7-13	Daytona Beach, Fla.	JULY	3	College Sta., Tex.	AUG.	27, 28	Indianapolis, Ind.
MAR.	20	Charlotte, N.C.	JULY	9	San Jose, Calif.	SEPT.	4	Middletown, N.Y.
MAY	8	Gardena, Calif.	JULY	10	Sonoma, Calif.	SEPT.	11	Syracuse, N.Y.
MAY	15	San Jose, Calif.	JULY	16	Castle Rock, Wash.	SEPT.	17	Toledo, O.
MAY	22	Oklahoma City, Okla.	JULY	23	Sacramento, Calif.	SEPT.	25	San Jose, Calif.
JUNE	4	Louisville, Ky.	JULY	31	Du Quoin, Ill.	OCT.	2	Riverside, Calif.
JUNE	11	Harrington, Del.	AUG.	5	Hinsdale, Ill.	OCT.	8	Gardena, Calif.
JUNE	19	Loudon, N.H.	AUG.	7	Peoria, Ill.	*OCT.	9	Sacramento, Calif.
JUNE	24	Hinsdale, Ill.	AUG.	14	Terre Haute, Ind.			*Tentative

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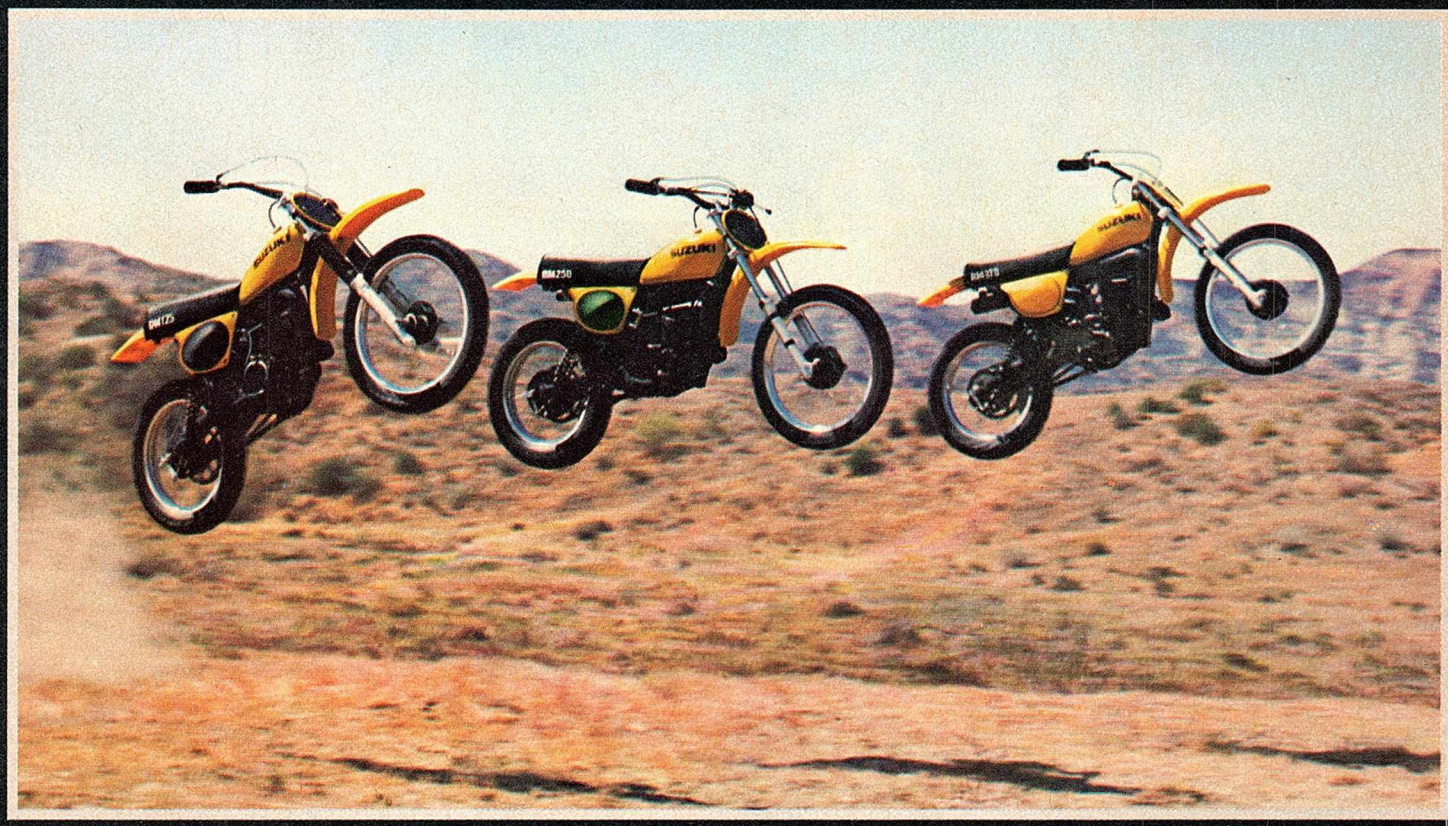

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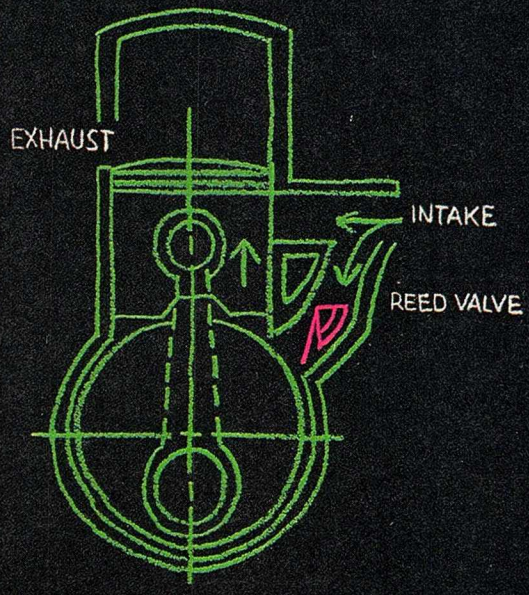

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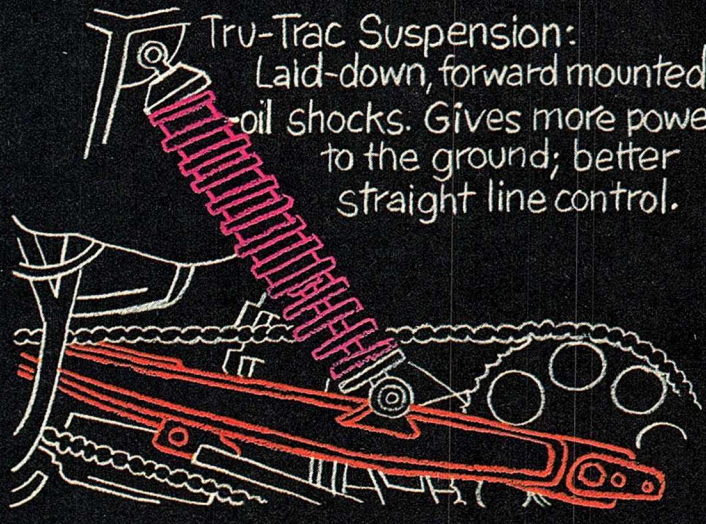
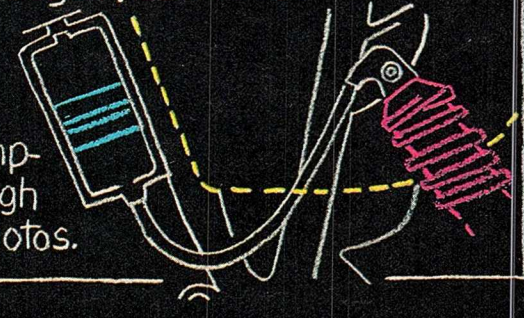
Tru-Trac Suspension: Laid-down, forward mounted gas-oil shocks. Gives more power to the ground; better straight line control.



"Cool-Flow" Nitrogen Reservoirs: Keeps shocks cooler longer. Insures more consistent damping even through long 40 min. motos.



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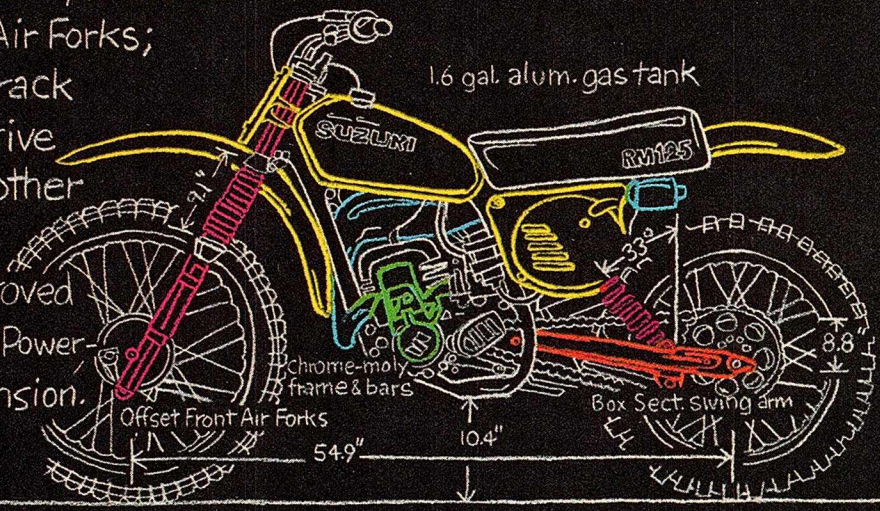
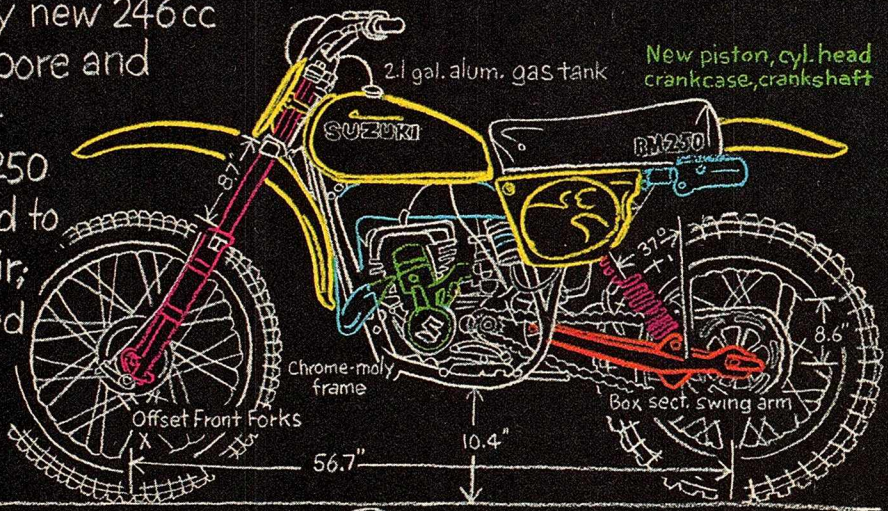
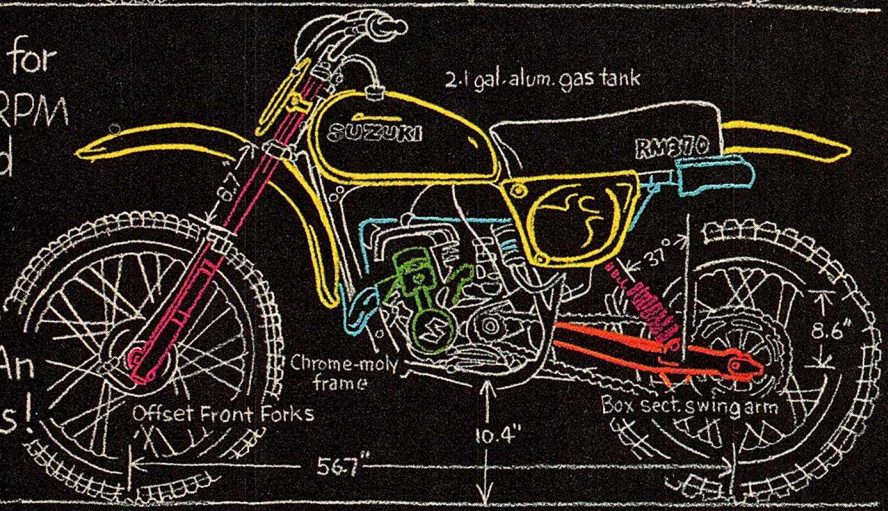


RM250: A wildcat! With a totally new 246 cc engine and more h.p. Longer bore and stroke combined with power-reed valve system gives the 250 blinding speed from bottom end to top. "Cool Flow" nitrogen reservoir; Tru-Trac suspension. Power-reed valve. Add all that to your skill and it's adios competition.



RM370: Goosed with more horses for improved performance from RPM one to the peak. Shocks moved even further forward. "Cool Flow" nitrogen reservoir. Tru-Trac suspension. Box section swing arm. Power-reed valve. An MX champ for champion MXers!



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Suzuki GT500	April
GT185	June
GT380	August
GT550	August
RM125A	July
GS750	September
Yamaha YZ400C	March
RD400C	April, August
XS500C	August
XT500 Enduro	May
YZ125X	July
IT400 Enduro	October

1977

Hercules 250 Enduro	February
Husqvarna 360 Automatic	January
Kawasaki KZ1000	February
Suzuki RM250B	January
Yamaha XS360-2D	February

1977 GuzziMatic

It's here! Moto Guzzi's 1977 revolutionary, 1000cc Automatic. An unparalleled blend of design and engineering in a truly unique machine.

An automatic, torque converter transmission which eliminates the chore of constant shifting. A new, emergency sidestand that automatically locks the rear wheel to prevent unexpected rolling. Electronic petcocks meter the flow of fuel through the twin carbs. Special air spoilers on the front safety bars increase high-speed stability. Air and oil filters increase performance and engine life. Standard footboards and high handle bars provide added touring comfort.

And when you're ready to ease the Guzzimatic to a stop, an exclusive, patented triple-disc integral braking system provides safe, sure stopping power.

All this plus Guzzi's race-tested cradle frame and suspension molded around a smooth, reliable shaft drive and a host of other owner benefits give the Guzzimatic a new mark in motorcycling individuality.

Inspect the exceptional, 1977 Guzzimatic 1000 at your nearest Guzzi dealer soon and see for yourself why Guzzi has become the increasing choice of knowledgeable motorcyclists. Available this year in four distinctive colors, black, silver, white and silver blue.

The Machine Built Exclusively For Unlimited Touring... In Style.

PREMIER MOTOR CORP.

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Exclusive Distributer in U.S. & Canada

Matching saddlebags standard equipment. Windshield optional.

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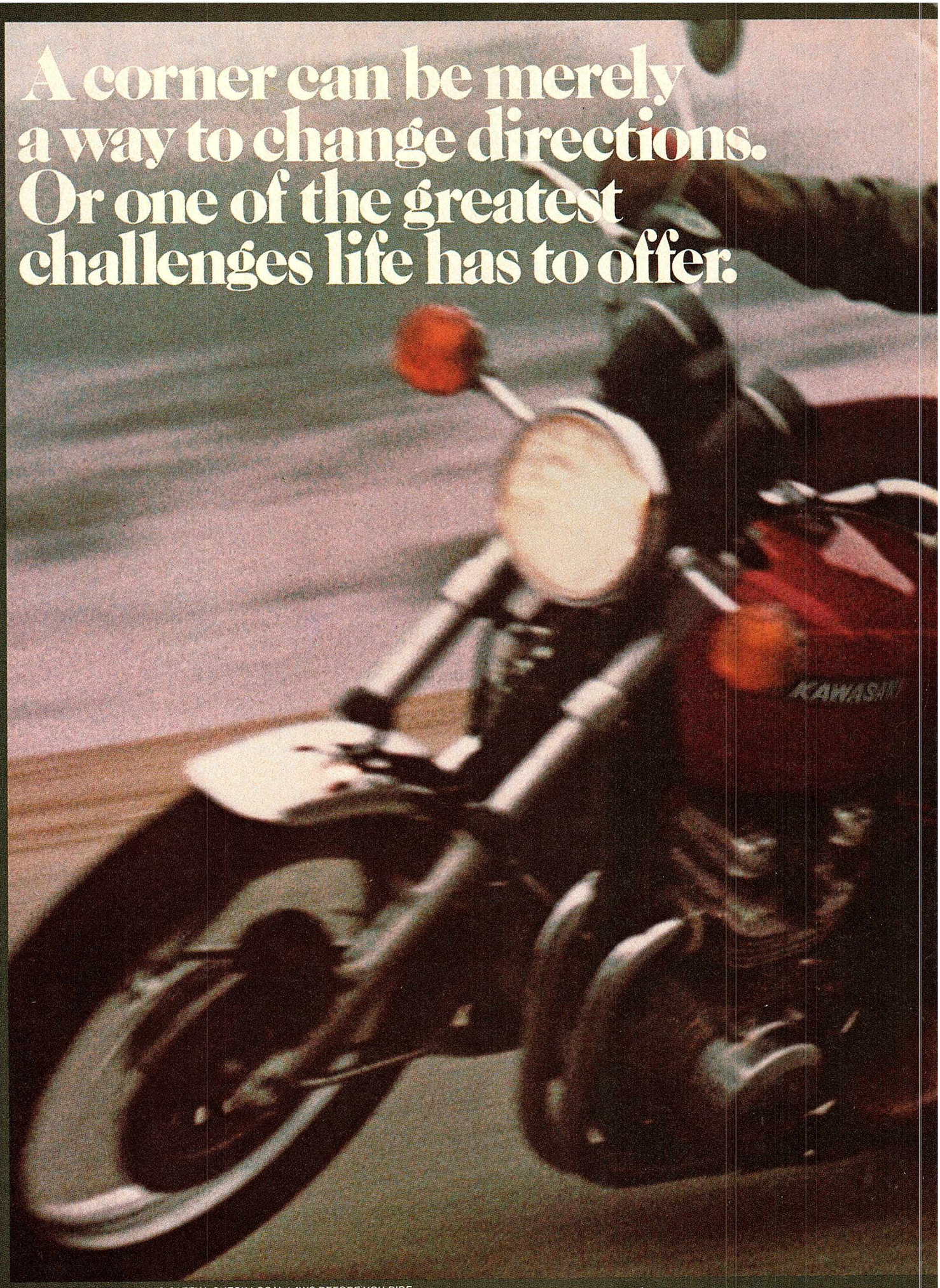

A corner can be merely
a way to change directions.
Or one of the greatest
challenges life has to offer.
KAWASAKI BELIEVES IN RIDING SAFELY. CHECK LOCAL LAWS BEFORE YOU RIDE.

The rollercoaster surge in your midsection as you commit yourself to the curve, the horizon going over on its side, and through your hands the almost sensuous feel of the front tire scratching for traction. Then, the triumphant bellow of the exhaust as you upshift into third, riding the torque curve clear to the outside edge of the road.

Good experiences like this happen a lot more often when you have a really good bike to share them with—like Kawasaki's new 650/4.

Its smooth, dependable double overhead camshaft 4-stroke churns out 64 hp. @ 8,500 rpm. And with only 7.3 lbs. per horsepower to propel, it can take you from zero to *omigod!* in almost no time at all. The 650/4 has plenty of rake and trail for high speed stability, and a low center of gravity plus plenty of ground clearance makes fast esses its play-toy. Big front disc brake and drum rear let you corner deeply and precisely.

In fact, when it comes to cornering ability from a box stock motorcycle, the Kawasaki 650/4 just might have cornered the market.

Kawasaki

We know why you ride.

CIRCLE NO. 24 ON READER SERVICE PAGE.

Bits

They're Selling In Africa

They're Selling in Africa: Honda recently reported that sales of motorcycles in Africa and the Middle East increased 57.9% over the previous year. And in case all you who own Hondas are wondering who owns Honda, here's the answer. The principal shareholders of Honda's common stock as of mid-1976 were: Japanese financial institutions, 38.3%; Japanese securities companies, 2.2%; other Japanese corporations, 22.6%; Japanese individuals and others, 31.6%; and foreign institutions and individuals, 5.3%.

Harleys in Baja: Bruce Ogilvie has won the 250cc class in the Baja 1000 for the last three years including one overall win. Despite his success, it's been tough to get official help from Milwaukee. Ogilvie's Southern California sponsor, Dale Marschke (Harley-Davidson of San Bernardino) has kept his man on the same bike for one-and-a-half years, or about 60 cross-country races. For the Baja 1000 the Harley-Davidson factory loaned Marschke a new motocross 250 prototype engine. Ogilvie said the unit appeared nearly identical to the enduro engine except the motocrosser had a steel liner rather than a chrome bore. Power, Bruce observed, was about the same as one of Marschke's slightly modified enduro engines. Anyway, they know what to ask for the next time: an engine *and* horsepower.

They're Slipping in Baja: Baja has been ravaged in the recent past by five storms; four blew out of the tropics and another came down from Alaska. While the land and its people have taken a beating, so has the peso, the value of which has been plunging. Gasoline used to average around 75 cents to the gallon; now 25 cents will buy a gallon. The bad situation has been compounded by an enormous drop in tourism, Baja's main industry. By the most conservative estimates, the tourist business is off 30 per cent. You might think this Mexican misery is a Yankee's paradise, now that accommodations are half the price they were a few months ago. But that's not necessarily true. Many of the large towns in Baja, including La Paz and Ensenada, are bankrupt—and without civil services.

Outlaws: A UPI report from Sacramento, California, carried news of missing money. It seems the legislative auditor general's office has discovered that 40 per cent of the off-road vehicles in California are not properly registered, and this little problem has caused the state and local governments to lose an estimated $3.2 million per annum in fees. The Department of Parks and Recreation believes about 700,000 off-road machines in California are subject to registration, most of which are motorcycles. But the Department of Motor Vehicle records show only 278,000 vehicles had been registered by the end of June 1976. The auditor general's office noted that the low registration has been caused by a lack of enforcement and "resistance" by owners.

Could you call it an off-road tax revolt?

Firestone Steps In: For the past two years Firestone Tire and Rubber Company has been doing intensive development and testing of motorcycle tires. The company has begun production of motorcycle tires for on- and off-road motorcycles, and those tires will be available in the spring of 1977. The new tires, incorporating advanced tread designs and the latest rubber compounds, will be marketed through motorcycle accessory distributors which will move them through motorcycle retail dealers.

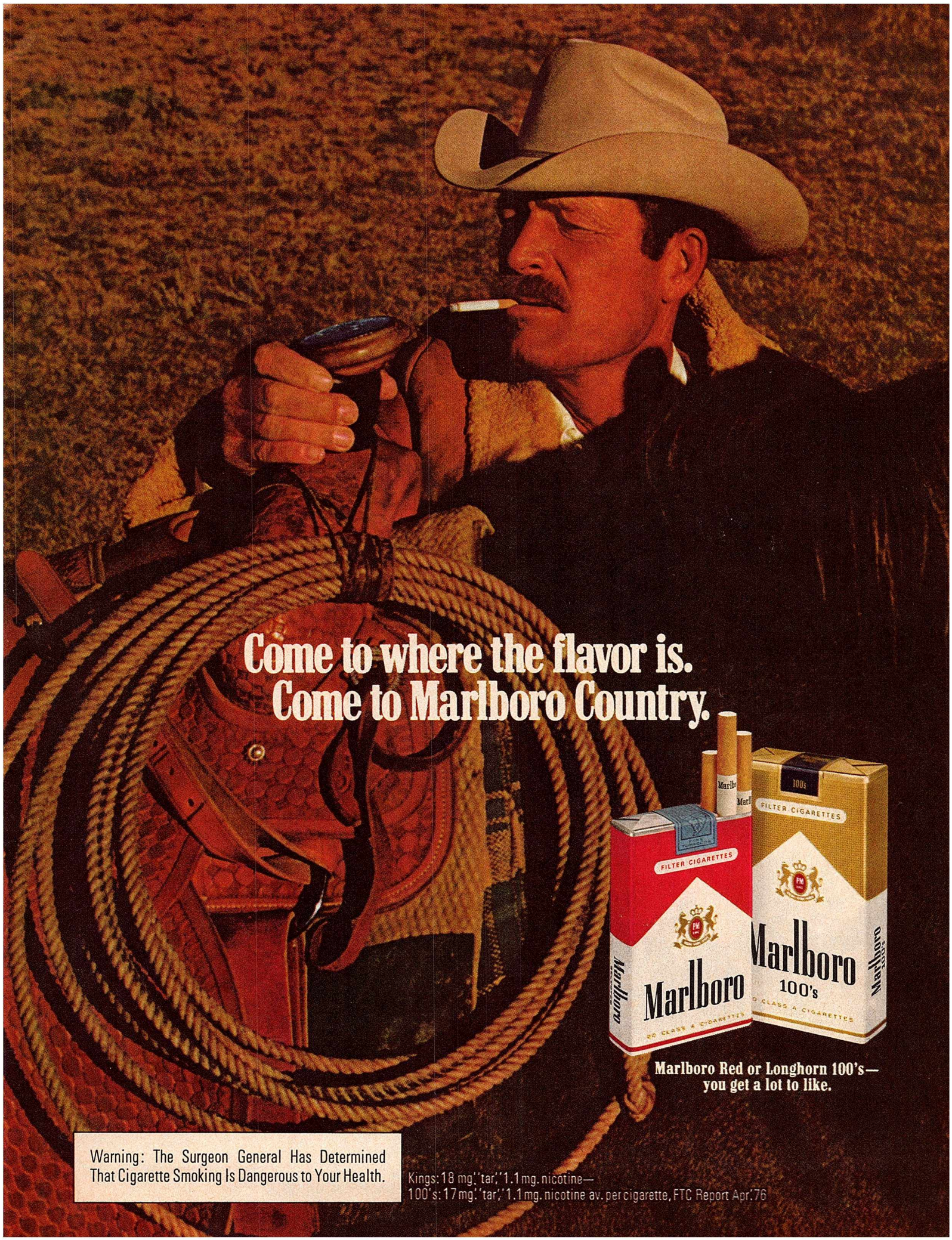
Firestone last built motorcycle tires in the United States in 1960. Welcome back, Harry.

De Coster & Trans-AMA: Roger De Coster made it seven out of ten to win the prestigious Trans-AMA for the third straight year. Although no one else in the seven-year history of the Trans-AMA has won the championship more than once, De Coster seems to have the series wired. De Coster won seven events overall, and had a third, a fifth—and a 19th place. He failed to finish only one moto out of 20, and his DNF came while leading the first Lexington, Ohio moto. What happened? On the last lap his Suzuki ingested some mud and water, and quit. But after that, De Coster hit his winning pace. He won the second moto, and then reeled off overall wins at the next four events. You could say that De Coster coasted to victory, but then again,we've never seen him coast. The first five Trans-AMA finishers were as follows:

1.	Roger De Coster (Suzuki)	410.5
2.	Brad Lackey (Husky)	279.6
3.	Jim Winert (Kawasaki)	274.9
4.	Gary Semics (Kawasaki)	262.2
5.	Gerrit Wolsink (Suzuki)	255.9

Leg Power: The International Human Powered Vehicle Association has announced the next International Human Powered Speed Championships. Unlike the USCF and other cycling groups, the IHPVA accepts any records set by purely human powered machines regardless of design. Streamlining, and other improvements, are legal. The championship is scheduled for April 30, 1977 at Ontario Motor Speedway. Entries from any source or country are welcome. For race rules, or further information, write to Chester Kyle, Mechanical Engineering Department, California State University, Long Beach, CA 90840. Just remember, anything that moves is legal so long as it is strictly human powered. Think of it as Superbicycle Production Racing.

See It Then: Rich Arian of Vanguard Engineering in San Rafael, CA is putting a three-week tour together for the 1977 Isle of Man TT races. The tour group—limited to 40 enthusiasts—will leave from Los Angeles and San Francisco the last week in May on a direct TWA flight to London. The price is $850, and it includes transportation to the IoM, three days accommodations in London and two weeks on the Island, including all meals and an assortment of passes and goodies at the races. Interested parties should contact Arian at Vanguard Engineering, 1121 Francisco Blvd., San Rafael, CA 94901.◉


Come to where the flavor is.
Come to Marlboro Country.
FILTER CIGARETTES
Marlboro
FILTER CIGARETTES
100's
Marlboro
100's
Marlboro Red or Longhorn 100's—
you get a lot to like.
Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.
Kings: 18 mg. "tar," 1.1 mg. nicotine—
100's: 17 mg. "tar," 1.1 mg. nicotine av. per cigarette, FTC Report Apr. '76

Cycle Test

KAWASAKI KZ1000

● RELAX, EVERYONE. Kawasaki's raucous, rambunctious Z-1 needed to have some of its bristles trimmed; the deed has been done and the transmuted article actually is an improvement over the original. The Z-1 has gained 20 pounds in becoming Kawasaki's new KZ1000, has lost a pair of mufflers, has fought its weight gain to a draw with a four-millimeter cylinder overbore, has had both its engine and chassis stiffened and rebalanced, has acquired a new seat, and has emerged from the transmutation quieter, smoother, more comfortable and even socio-ecologically enhanced without having lost any of that old-time, arm-straightening performance. More pieces have been changed than were left the same, but the King of Superbikes still wears the crown.

Much of the impetus for a major rework of the big Kawasaki four was provided by the steady lowering of statutory noise limits. A motorcycle emits noise from a number of sources other than its exhaust pipes: gear whine, piston slap, the click of cam lobes against followers and even bearing rumble make contributions to the total noise emission. The old Z-1 tested at

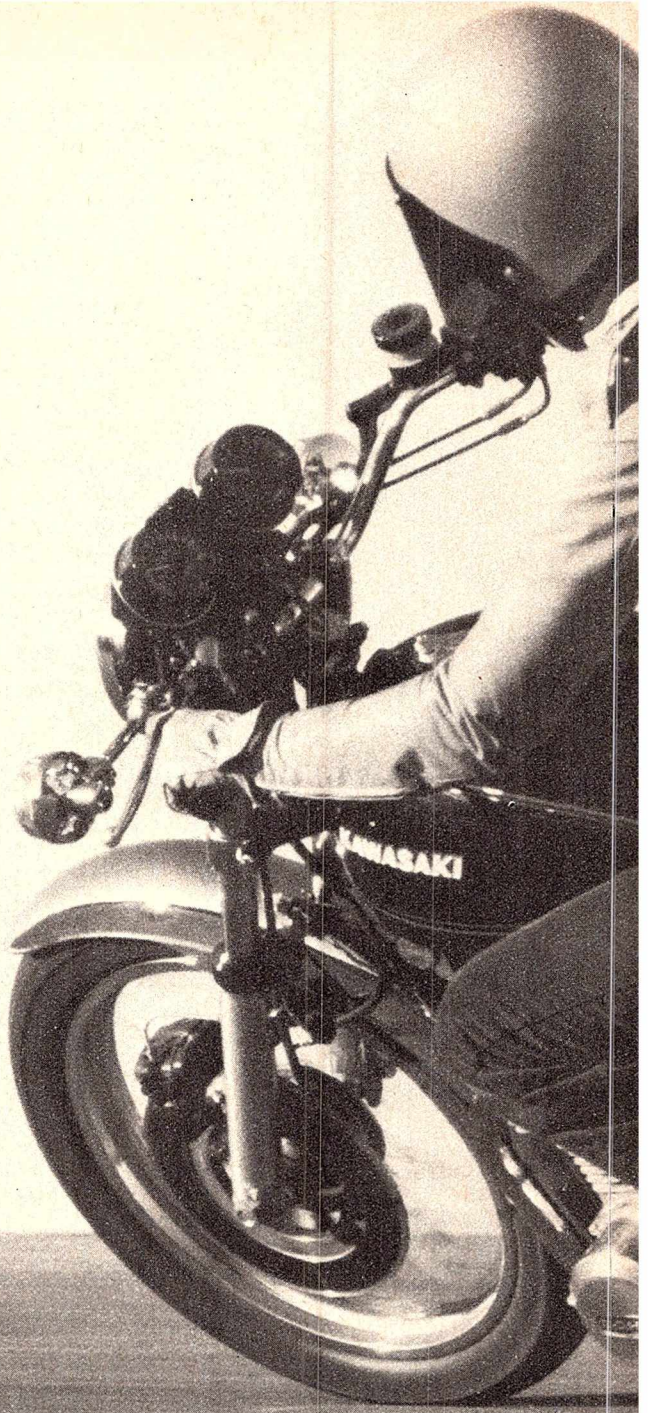
about 84 dB(A) and it's entirely possible that Kawasaki could have corked it down to around 80 decibels with a new set of mufflers. We're glad they didn't try: had they subtracted from the bike's exhaust note alone that would have left us with a big earful of clicks, whines, clacks and rumbles, and an engine so constipated its performance edge would be nothing but a sad memory.

What Kawasaki did, in making a quiet KZ1000 out of the clattery, chattery Z-1, was to go for a reduction in the kind of noise motorcyclists don't want to hear in

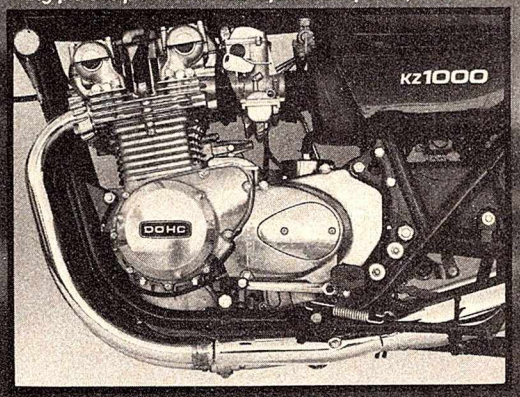
You always hear that the new models are longer, bigger, wider, smoother and a treat for the jaded eye, and this one actually is.
KZ1000
PHOTOGRAPHY: MICHAEL GOING

any case. They tightened the piston clearances slightly to reduce slap, and similarly closed the gaps between gear teeth in the primary drive and transmission. Then, to contain such mechanical noise as was inevitably left, certain of the engine castings were made thicker (specifically, the cam, alternator and ignition covers, for sure, and our sources at American Kawasaki think the crankcases have been stiffened here and there as well). Also, because the threshing of the drive chain against the fast-turning transmission sprocket is a potent generator of racket, Kawasaki lined the cast-aluminum drive-sprocket cover with a sound-deadening blanket held in place with a perforated sheet-metal shield. And these measures have worked extremely well: you get a bit of rattle from the long camshaft drive chain when the engine is cold, before thermal expansion moves the crank and cams apart and takes up the slack, but even that is only a pale ghost of the robust gnash and jangle surrounding every Z-1 we've known.

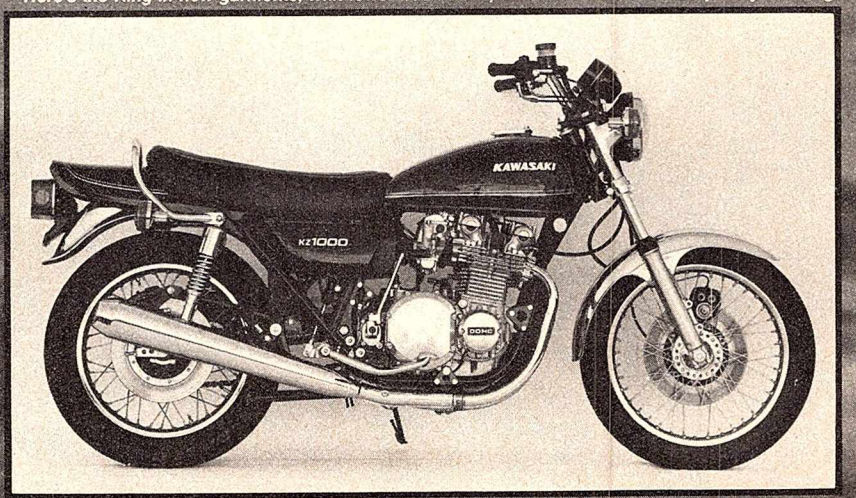
Kawasaki hasn't ignored the engine's intake and exhaust noises. Last year's glasspack intake muffler has been replaced with a length of smooth-wall plastic pipe, and the silencing is now done by a second plenum chamber having a baffled air entry. This arrangement clearly works, as the KZ1000 definitely isn't hurting for power and you don't hear much sound that can be identified as carburetor honk. Unfortunately, it has its price, as the bike's battery is buried under the intake



Big pistons plus closer fits equal more power, less noise.



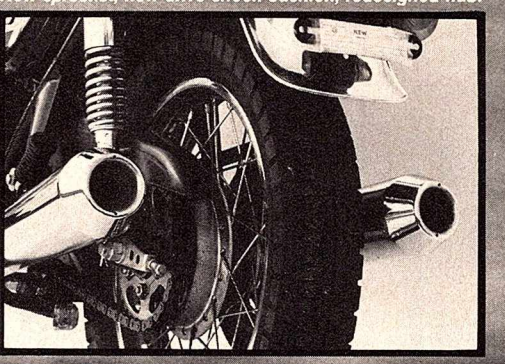
Here's the King in new garments, with fewer bad habits, and more than ever completely the King.

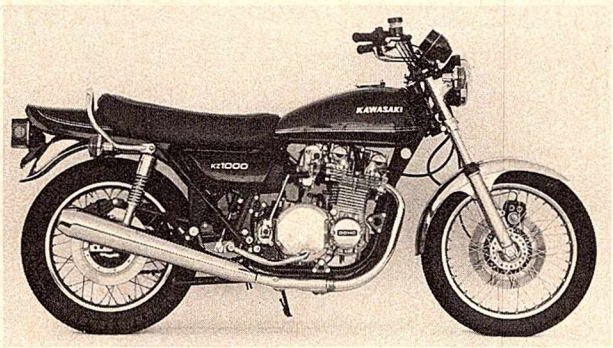


Riding one of Kawasaki's big fours means never having to be sorry there's not more power.

The KayZee has enough cornering clearance to let you run right off the tires.

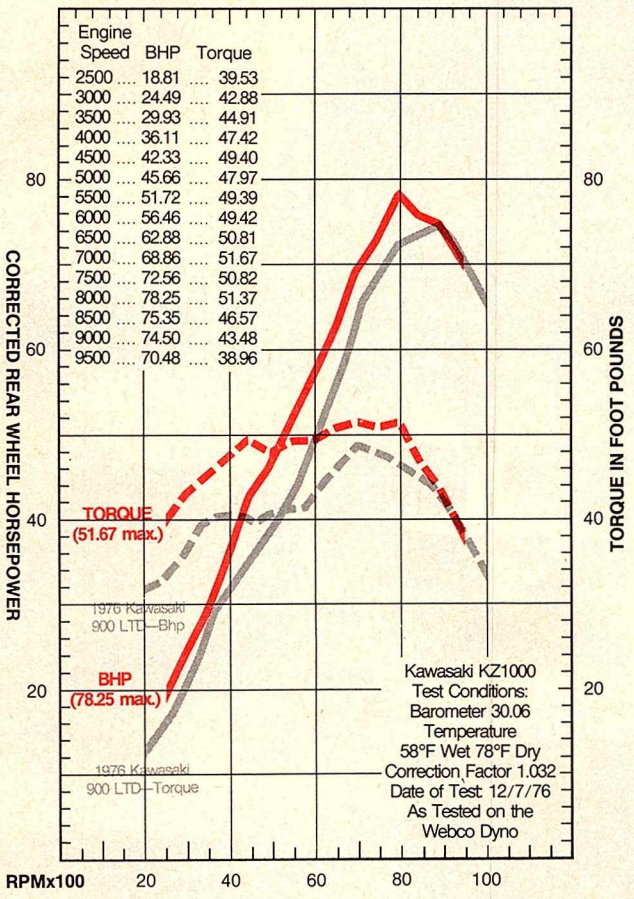
New sprocket, new drive-shock cushion, redesigned hub.

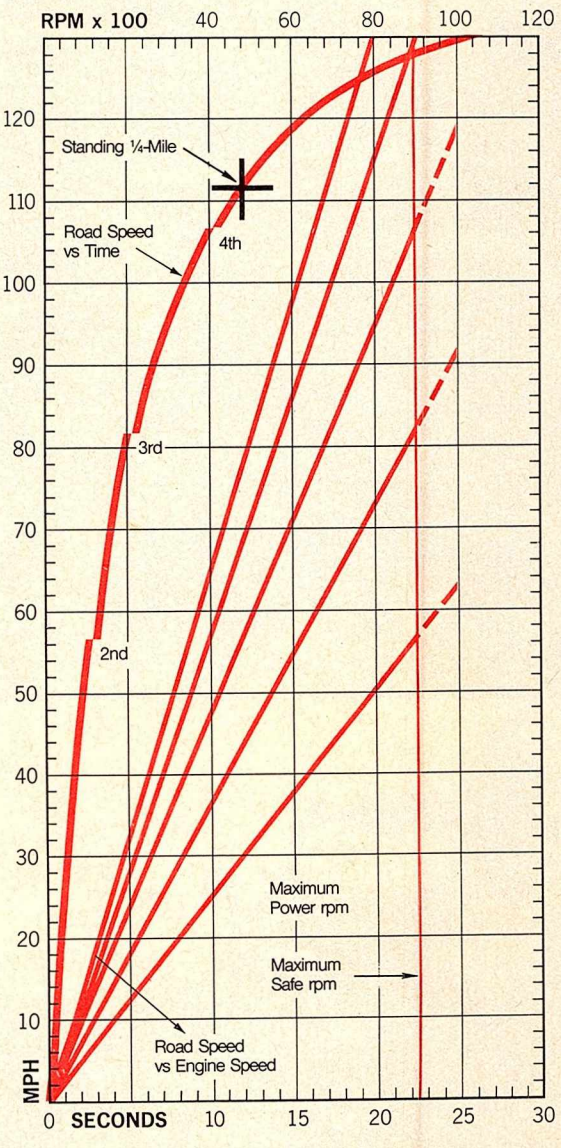




KAWASAKI KZ1000

Price, suggested retail	$2575
Tire, front	3.25H-19 Dunlop F6
rear	4.00H-18 Dunlop K87
Brake, front	Disc, 11.65 x 1.61 in. (296 x 41mm) x 2
rear	Disc, 11.50 x 1.54 in. (292 x 39mm) x 2
Brake swept area	151.6 sq. in. (978 sq. cm.)
Specific brake loading	4.81 lbs./sq. in. at test weight
Engine type	Four-stroke, DOHC, air-cooled four
Bore and stroke	2.76 x 2.60 in. (70 x 66mm)
Piston displacement	61.9 cu. in. (1015cc)
Compression ratio	8.7:1
Carburetion	4, 26mm; Mikuni VM26SS
Air filtration	Dry element, pleated
Ignition	Battery and coil
Rake/Trail	26°/3.54 in. (90mm)
Mph/1000 rpm, top gear	16.3
Fuel capacity	4.5 gal. (17.0 liters)
Oil capacity	3.9 qt. (3.7 liters)
Electrical power	Alternator, permanent field
Battery	12V, 14 AH
Primary transmission	1.73:1 (97/56) spur gears
Secondary transmission	4.64:1 (33/15) Enuma endless chain, EK630S-T30
Gear ratios, overall	(1) 12.07 (2) 8.34 (3) 6.37 (4) 5.25 (5) 4.64
Wheelbase	59.25 in. (1505mm)
Seat height	31.5 (800mm)
Ground clearance	6.3 in. (160mm)
Curb weight	564 lbs. (255.8kg)
Test weight	729 lbs. (330.6kg)
Instruments	Tachometer, speedometer, odometer w/tripmeter
Standing start ¼-mile	12.06 sec @ 111.66 mph
Average fuel consumption	36.3 mpg
Speedometer error	indicated 30 mph, actual 29.5 indicated 60 mph, actual 55.3

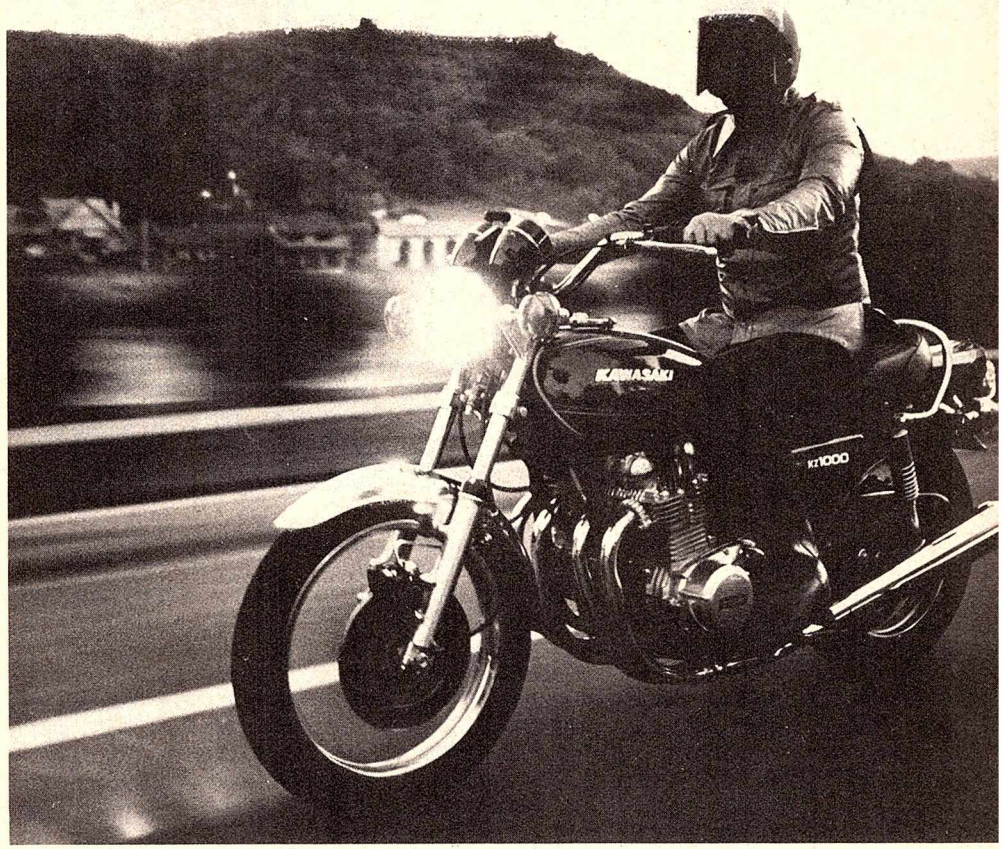




plumbing and is flanked on all sides by thickets of electrical and other hardware. So there's no way you can check electrolyte levels without removing the battery from the bike, you will have to remove part of the intake air system to get at the battery, and the KZ1000's rather crude charge-rate control (more on this later) insures that this bike's battery cells—like those in the Z-1—will require frequent replenishing with distilled water.

The biggest visual difference between the Z-1 and the KZ1000 is in their exhaust systems. The older bike's was a four-piper all the way, with small balance tubes connecting the paired mufflers on each side of the machine. The new system is a four-into-two design, with the pipes for cylinders one/two and three/four converging in Y-junctions about 30 inches downstream from the exhaust valves. The KZ1000's exhaust then feeds into two double-walled mufflers with complex and circuitous baffling in a manner much like that employed by Suzuki for the GS750, except that the Suzuki doesn't have Kawasaki's cross-over pipe linking the two mufflers. We think the cross-over probably is very important. Individual exhaust pulses ended up escaping from two 20mm holes in the old four-pipe system; they find the same exit area available in the new twin-muffler arrangement . . . but have to travel somewhat farther to make their escape.

Seven of the pounds gained by the Z-1 in becoming a KZ1000 are in the new bike's crankshaft, added to give it a tad more flywheel inertia, and as counterweighting for the bigger pistons. The engine's bore diameter has been increased from 66mm to 70mm, raising its total displacement from 903cc to 1015cc. Apart from that, the engine's internal configuration hasn't been changed appreciably. The combustion chambers weren't widened, so there's a two millimeter lip/squish band around the bore, and it is possible to fit the new 70mm pistons in a 903 engine—though a four millimeter overbore will leave the old block's cylinder liners a little thin. With the new pistons you'll get improved rings, with a completely new three-piece oil ring. We also note that there are different part numbers for practically all the engine's components, including the cylinderhead, camshafts, valves and cam followers, but we don't know just how much the change in numbers means in terms of materials or dimensions. The valve timing specifications haven't changed; there may be some differences in materials or surface treatments to let the engine use unleaded fuels. We do note that the cylinder/head studs have been strengthened, and their torque specification increased, which means the KZ1000 will handle more compression than the old Z-1—more than it got, which was from 8.5 to 8.7:1.



***Gone is the vinyl crucifix, the old high-crowned seat, replaced with one that's broad, soft and* right.**

Some of the original Z-1's soaring eagerness to rev was lost back when its carburetors were reduced in throat size from 28mm to 26mm. Performance freaks might wish that this new big-bore engine would have the big-bore carburetors. It doesn't, though what it has are different from those used on the last 903. Kawasaki clearly chose to trade some of the KZ1000's potential top-end rush for mid-range punch, and sticking with 26mm carburetors was a good way to make that happen. But though the throat diameters are the same the carburetors aren't: the new ones still have pull/pull slides, as before, and employ the same typically-Mikuni cold-start valves, but have completely different idle-mixture circuits. In the old carburetors a fixed jet supplied idle-mixture fuel, and the mixture was varied in strength with a needle-valve air control. The new carburetors have fixed fuel and air jets, with a needle valve to vary the amount of air/fuel emulsion delivered to the feed holes straddling the rear edges of the throttle slides. Why the change? We're not entirely sure. The old carburetors were extremely touchy about idle mixture adjustment and a screwdriver-tremble either side of perfect made the engine run funny; precisely the same is true of the new ones. We are told that the new carburetors are part of a cleaner-air package Kawasaki is working up in anticipation of motorcycle emission controls lurking just over the horizon, and in

(Continued on page 114)

BEYOND RACER ROAD: THE CALIFORNIA HOT ROD

A season of 'gator-pit, knock-head, AMA Superbike Production racing.

By Cook Neilson

● IT WAS FOUR O'CLOCK IN THE MORNING, JANUARY 22. A radio program having to do with style and manners in ancient Persia had just concluded, and listeners began phoning in about gun control, a hot issue in Southern California.

"What a bunch of weirdos," Schilling said, sprinkling shims into the Ducati's transmission. "Who'd be up at four in the morning talking to a radio host about gun control?"

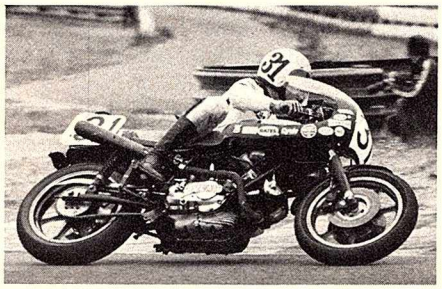
"Just a minute," I said. "It's four in the morning here too. *And we're listening.*"

That wasn't all we listened to during those pre-Daytona months. We beamed in on interviews with lower-echelon political figures, discussions with pet experts, symphonies, farm reports, lectures on criminal psychology, skin care, the Code of Hamurabi and the Non-Proliferation Agreement. We became expert on matters concerning body language, sensible shoe selection and the perversity of the major networks. We were apprised on a nightly basis of NBA scores and the Top Forty rock'n'stomp hits. We visited the Golden Graveyard every half-hour.

By January 22 Schilling and I were into our "three-shift" mode. We arrived at work at nine in the morning and devoted ourselves to magazine affairs until five in the afternoon: Shift One. At five we would fall to on the race bike, and flog it until midnight: Shift Two. After dinner at Sambo's we would return to the shop and work until six AM: Shift Three. Then to Sambo's for coffee and apple pie, home to bed, and back to work at nine to begin the cycle once again. Intermittantly one or the other of us wouldn't make it home at all, and staff-members became accustomed to finding either Phil or me asleep in the conference room at 9:30 or 10 in the morning, greasy, unshaven and punctured by fatigue.

All of this was on behalf of our Ducati Super Sport Production Racer, scheduled to be in Sid Damron's trailer and on its way to Daytona no later than February 24. With a month to go before the bike was due to be shipped, we were in trouble; three-shifting was the only way out.

It wasn't as if we had started late. The last race of the 1975 season had occurred in early October. By the first of November the bike was beginning to be formed for the '76 season. The chassis had been sand-blasted, Magnafluxed and repainted. The wiring was done, suspension was done, wheels and bearings seen to, the fairing was painted and the fuel tank was resealed. Only the engine was incomplete, and as of January 22 we were



waiting for cylinder heads to come back from Jerry Branch, overbored cylinders from ZDS Motors, pistons and rings from Venolia and Divine Intervention from God.

If the AMA hadn't changed its rules for Production Racing between the '75 and '76 seasons it all would have been easier. The '75 rules provided for a 750 class. There was none proposed for '76, all big-bore Production bikes being melded into a single class. After discussing the matter for ten minutes Schilling and I had decided to go for it. Since the Ducati had been competitive with 900cc machines when it was just a 750, we felt that in big-motor trim it should be able to run with 1000cc BMWs and Kawasakis. We were also tempted by a rules structure that appeared so amiable we could wander around in it with little fear of bumping into anything unpleasant.

"There is nothing illusory about California's capabilities. The Los Angeles motor culture is so advanced, its artisans so congenial and its technology so accessible, that a search for an answer becomes a search for the man who knows the answer."

The rules for AMA Superbike Production were as follows: 1000cc (plus .040"-over) maximum engine displacement; standard muffler shells; standard carburetor bodies; a working head- and taillight; 115 dB(A) noise limit, measured at half maximum engine speed; and a standard chassis, with reinforcing permitted. The bikes otherwise were to resemble standard, street-going vehicles with regard to tanks, seats, fenders, etc.

"What we have here," Schilling and I agreed upon looking over the 1976 Supplementary Regulations, "is four-stroke GP, with lights."

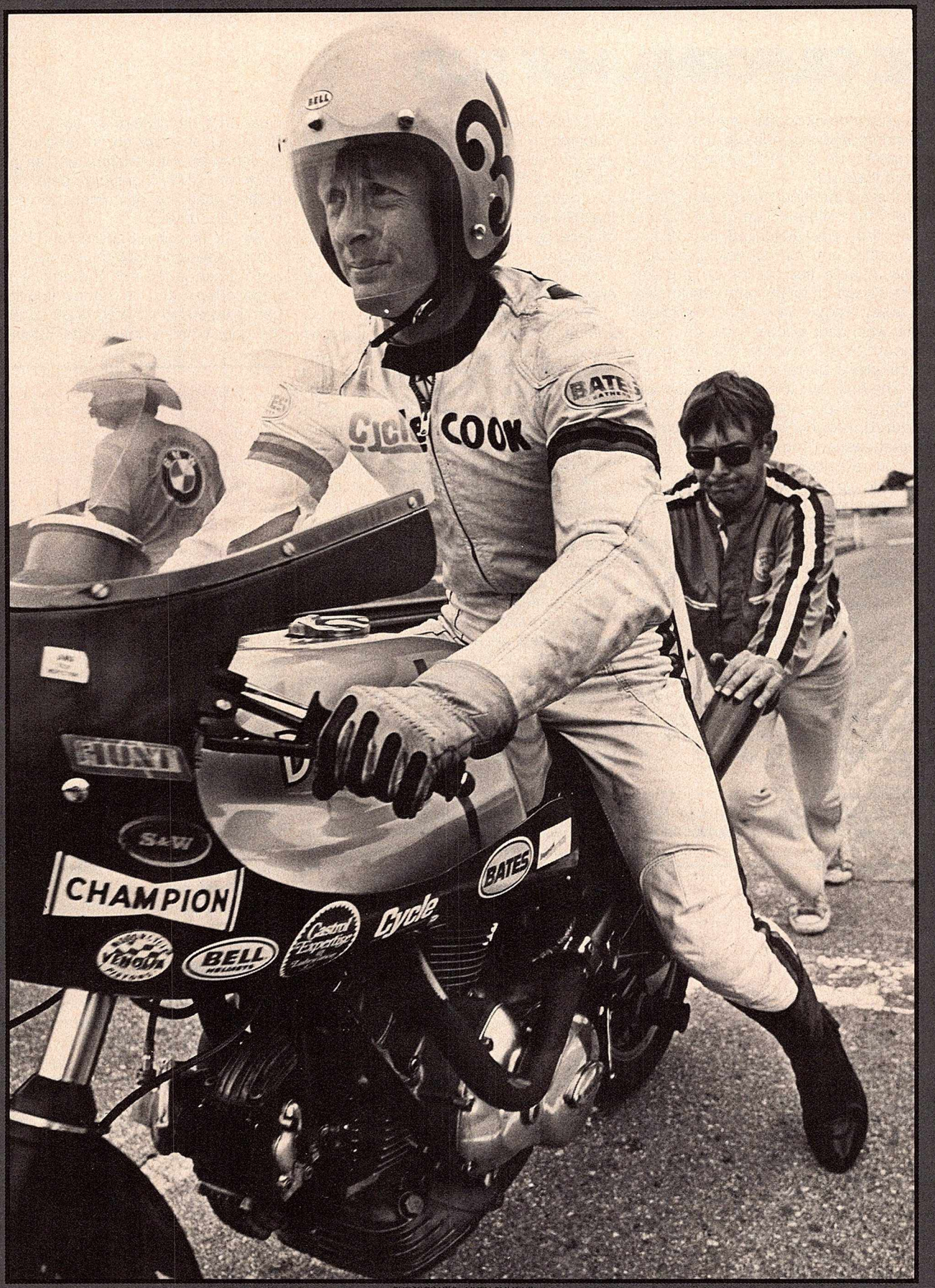
Such a conclusion was easy to reach, being familiar with AMA tech inspection, post-race tear-down procedures and the tacit agreement among Production participants to recognize the umbrella of guilt that shielded us all from the embarrassment of a protest. The BMW and Kawasaki people knew specifically which components in our Ducati were illegal, and we had an equivalent amount of dirt on them, and they on each other.

The AMA would see to it that engine displacement limits were not violated. Their fuel checks would detect any funny business with nitromethane or hydrazine. Their magnets would point the way towards titanium where it did not belong. The rest of the policing was left to the participants. Which was like asking politicians to count their own votes or the Friends of Willie Sutton to audit the Chase Manhattan.

The 1975 regulations were wide-ranging, specific and violated. The '76 rules were brief, alluring and vulnerable. Our first port of call was the cylinder head emporium of Jerry Branch. "Jerry," we asked, "we have to know how much displacement these heads can be persuaded to feed." Jerry ground, measured, flowed, calculated, increased valve sizes from 40 and 36mm to 42 and 38mm, welded up and recontoured the intake manifolds, polished, shaped and fussed. "I think about 900cc would be your maximum," he said.

We fled to our calculators and decided on an 87mm bore size, a 7mm increase over stock. Then we called Venolia about pistons and arranged for ZDS to bore out the crankcases and the cylinders to accept Ducati 450 liners. We had by then given up hope for assistance from the Ducati factory. We had requested certain special parts, through Berliner, in October of 1975. The parts list had included crankshafts, big bore cylinders and pistons, oil cooler apparatus, inlet manifolds with carburetors and exhaust pipes. We knew such parts existed. We had seen some of them with our own eyes. We thought we would be able to buy them because our 750 had been so successful in 1975. Wrong-o, wrong-o. By January of 1976 nothing had come. Panicking, Phil and I decided to try to do it ourselves, using traditional West Coast hot rod sources and methodology.

You've all read the following: "We don't care how the hell they do it in California." The statement has appeared in print, on bumper stickers, on T-shirts. The tone is clear: California has for so long provided



PHOTOGRAPHY: MUSH EMMONS

THE CALIFORNIA HOT ROD

the mother lode of goods, services, solutions, riders and ingenuity to the American motorcycle scene that people are sick and tired of it.

Yet there is nothing illusory about California's capabilities. The Los Angeles motor culture is so advanced, its artisans so congenial and its technology so accessible, that a search for an answer becomes a search for the man who knows the answer. People who can't help know people who can; people who can, do. Southern California was for us not simply a place where there are answers; it *became* The Answer. "If we were in Nebraska," Phil said one night, fondling a recontoured, Magnafluxed, re-chromed and shot-peened rocker arm, "we'd be dead." In recognition of what we were trying to do and how we were trying to do it, we began referring to the Ducati as the California Hot Rod.

We had no new crankshafts. But we did have one fresh one, hiding in the cases of my street Super Sport, and ZDS had a new rod assembly. They installed the rod assembly in the crank we had used during the '75 season, and my street SS yielded up its fresh crank. This switch-around established a pattern we were to follow all season, ultimately resulting in one race engine containing parts from three different Super Sports (one of Phil's and two of mine) and one Ducati GT (Matt Owens').

January 23 was a Friday, and everything happened at once. The Venolia pistons, with cast iron rings, arrived in the morning. They were brought to ZDS to be fitted to the cylinders. The timing gears and transmission parts were ready to come back from Bob Gorsuch, the Magnafluxer. Branch had finished with the heads. By Friday afternoon we had what we needed to build our first 883cc engine; by Monday morning, January 25, we had a runner, and were on our way to Irwindale Drag Strip for the news.

"We were insulated from despair by the certain knowledge that we had done all we could for our Ducati. And after all, we had all those spare parts and sleepless nights as amulets against disaster."

It turned out to be bad. As a 750 the Ducati had produced quarter-mile times of 12.06—113.56 mph. The 883 engine, belching oil-smoke from mufflers gutted and coned by Pierre DesRoches, ran 11.78—114.50. We knew that the bike had to produce terminal quarter-mile times in the 120-mph neighborhood to have a chance against the big BMWs and Kawasakis.

We called Branch. "Jerry," I said, "the engine isn't making any power."

"Bring the heads down here as fast as you can," Jerry said. I had them there by Monday afternoon. By Tuesday they were ready. We bolted them on and went back to Irwindale Wednesday. The bike ran 11.52—118 still troubled by oil control problems. Even so, we were encouraged. There was to be a CMC race at Willow Springs the following Sunday, February 1.

The Willow outing confirmed what we suspected: the oil-control problems weren't going to go away. Although the bike won the Super Café class it did it rattling with detonation on borrowed NGK 7 spark plugs, not exactly your max-perf racing igniters.

Monday was tear-down. The pistons and cylinders were a mess. I took the two pistons down to Venolia and asked if they could make two more, identical to the first but with more compression (we started with 8.5:1) and machined to accept Yamaha XT500 rings. Sure, they said. Hurrying home, I called Yamaha for four sets of rings and inquired after ring groove dimensions, which were supplied by Ken Smith and relayed to Venolia.

By February 12 the pistons were done, the rings had arrived, and after our machinist did his thing on the interiors of the pistons and the Toyota wrist pins to remove weight, we assembled the Stage 2 engine and went back to Irwindale the following day, a Friday. The rings sealed perfectly, the bike ran 119mph in the quarter and we decided to partake of an AFM race at Ontario that Sunday, February 11. It was to be the final shake-down before Daytona.

The 917cc BMW, the one that had run the year before with Reg Pridmore in the saddle, was also at Ontario that Sunday. Their plan was to rattle some of the winter's rust off riders Pridmore and Steve McLaughlin, and to continue to acquaint McLaughlin, a newly-signed team-member, with the BMW's idiosyncracies.

The Ducati's engine absolutely killed the BM. We ran in Open Production against Steve; Reg planned to ride the bike in Super Street. McLaughlin and I had an invigorating little dice for the first half of the race, during which it became clear that the Ducati could smoke the BMW out of every corner and up every straightaway. Steve ultimately ran off the track, the BMW ingesting some dirt and putting itself out of commission for the rest of the day.

For the first time Schilling and I permitted ourselves to feel genuinely encouraged. Even jetted rich the engine made good power, and its astonishing torque permitted me to accelerate off corners in the gear of my choice. After Steve had retired, and with a decent lead over the rest of the field, I ran the bike all the way from Ontario's Turn 2 to Turn 18 in fourth gear, just to see if the bike would do it. With good power from 1800 to 8800 rpm, it was a cinch. "This thing ain't a motorcycle," I told Phil, "it's a locomotive."

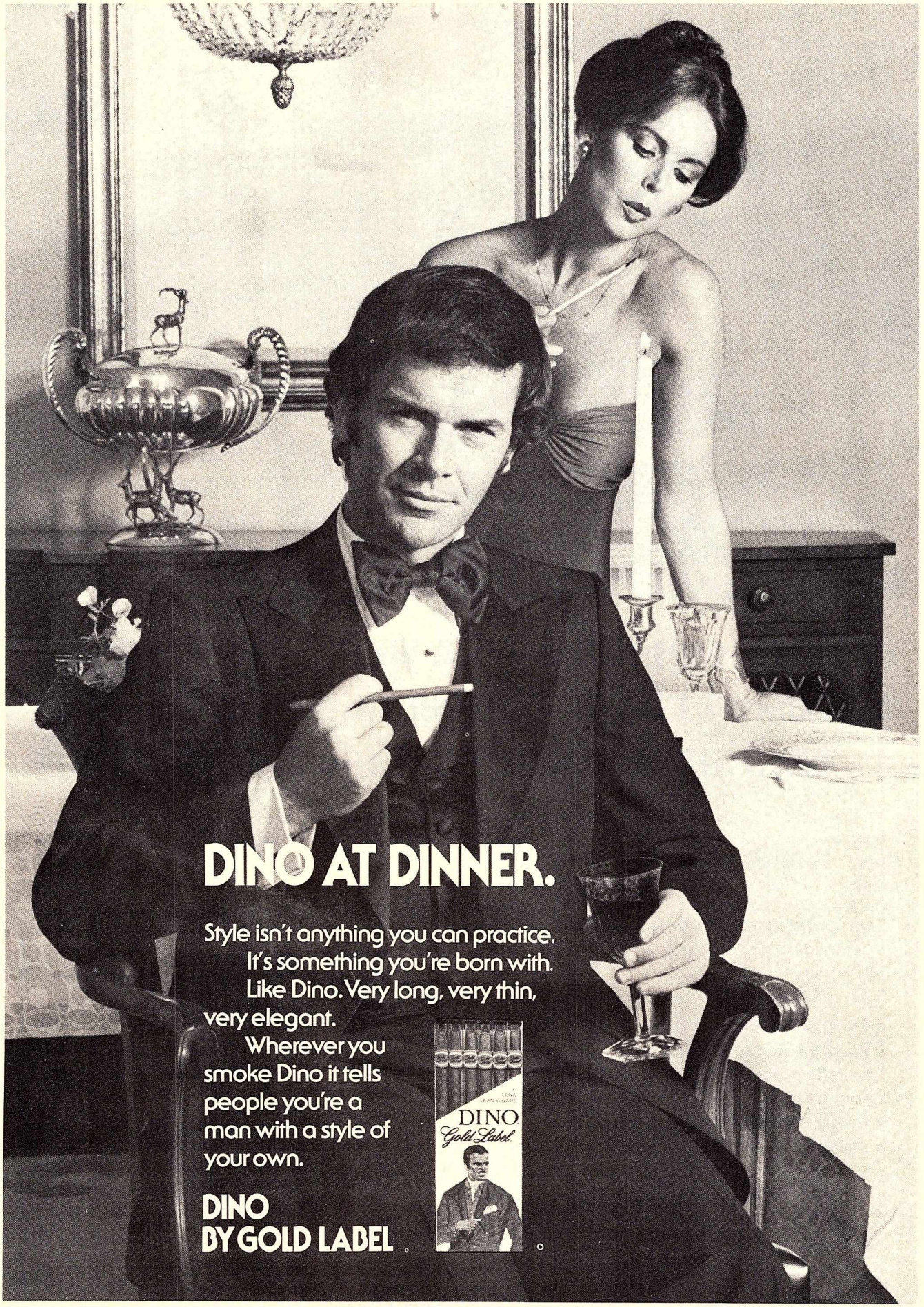
"In exchange for the honor of having Ken Roberts ride a bike which Phil and I had developed, assembled and massaged, we took the chance of discovering warts on its character we never suspected were there."

The following Monday night teardown showed all to be in order—except the transmission. Some gear teeth looked supicious, so I took them back to Gorsuch for a quick Magnflux. Bob was hardly thrilled by what he saw.

"The problem here," Gorsuch said, "is that the material isn't too good. It's okay for a street motor, but not for a race bike. What they do is use soft material to make it easy to machine, and then they case-harden it for some durability. The case-hardening is popping off here, and here, and here, and the teeth on these gears—this one and this one—are looking edgy."

It was to be a problem that would plague us all season. Luckily, Gorsuch's place was practically next door to ZDS. That day I began a drill that would be repeated throughout the season: have the gearbox Magnfluxed, take the suspect components over to ZDS, replace them with new ones, bring the new pieces back to Gorsuch, wait while he Magnafluxed them, and then return to our shop and deposit the new components in Schilling's anxious paws.

After the AFM Ontario race we had two weeks before the Duck was to be shipped to Daytona, and it was during this period that the project threatened to crush us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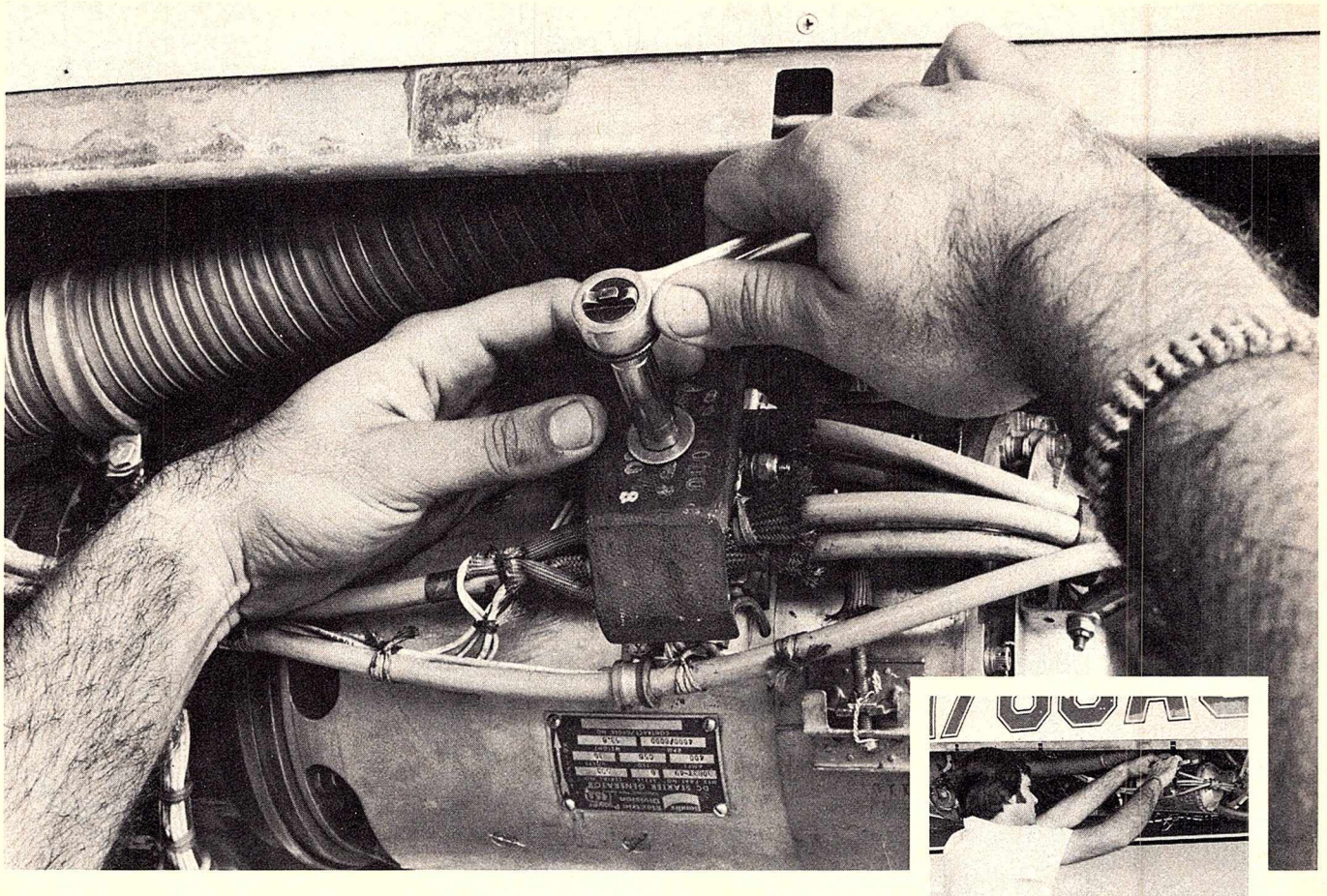

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under its own looming momentum. "Daytona comes but once a year," we intoned to each other and to the *Cycle* staff. "Daytona's 3000 miles away," we would reiterate solemnly. "We've got so much work in it already, why not a little more?"

The project had begun the previous October. Since then we had attended to thousands of details; lost hundreds of hours of sleep; imposed on all of our friends; stolen time from the magazine; borrowed parts it seemed from every Ducati in Southern California; and in general had made a perfectly enormous commitment to an undertaking which began as a project and turned into a crusade.

After the Ontario shake-down we searched frantically for the hidden flaw that might ruin everything we had already accomplished. We had to build a spare engine. We had to bolt together a spare fork. Find an alternative oil cooler, just in case. Locate all the bits and ends which would be necessary if the AMA decided to be sniffish about the rules. Spare fuel tank. Spare wheels. Spare chassis. Two spare fairings. Bearings and fasteners. Gearing, final and primary. Spare ignition components, and complete gasket sets. Fenders. Axles. Swing-arm pivots. Our warmest sanctuary was simply this: in the event of failure and embarrassment, no one could acuse us of being lazy.

In addition to fears of our own potential unpreparedness we had other things to worry about. The Southern California grapevine was humming daily with Daytona rumors. The Yoshimura Kawasaki Z-1s had made over 117 bhp on Pops' dyno. The Dale-Starr Kawasakis were making 95 on the Webco dyno. The BMWs, under construction in New Jersey, were going to have Monoshock rear suspensions. Berliner was going to sponsor a very special 850cc Moto Guzzi, to be ridden by Mike Baldwin, whom we knew to be a lion. Kurt Liebmann had a Ducati SS with some factory parts in it. Keith Harte from Canada had a Super Sport with *nothing but* factory parts in it. We had a California Hot Rod: Harley-Davidson inlet valves, BMW exhausts, Toyota wrist pins, Yamaha rings, Venolia pistons, K-Mart ignition coils, boxes and boxes of spare parts and Magnaflux stamps all over the place.

"Counting the 1381A we had arrived with and the new D1750 we installed Saturday evening, the Duck had worn three new tires in a single day, which strikes me as being a fine display of big-time decadence."

Certainly we were worried about the 1000cc Kawasakis. The rules changes seemed to favor the big fours more than any other model. But we were *really* concerned about the BMWs. We knew that Udo Gietl was building them and that Pridmore, Gary Fisher and McLaughlin were scheduled to be the riders. We knew that they would have 40mm worth of carburetor on each head, we knew that they would be at the 1000cc displacement limit, we knew that Venolia was doing the pistons and Sig Erson the cams, and we knew that Gietl had made some chassis changes to accommodate formal racing slicks. So we kept putting spare parts in boxes and making check-lists and festooning the exterior of the Ducati in safety wire, bracing ourselves for the shock that would come when we first laid eyes on the Butler & Smith Racing Team.

That came Saturday night, February 28, in the parking lot of the Indigo Inn in Daytona Beach. Miles Rossteucher unlocked the BMW truck's huge rear door and Udo said, "There they are. Monoshockers." We climbed in, Phil and I, and poked around in the darkness. Only later, after extensive conversations with Gietl and Kenny Augustine (who had done the cylinder head work and assisted in the construction) did we know what lurked in the back of the truck. The engines had 12.2–1 compression; yards of valve lift; Michelin slicks; the rear accommodated by an offset wheel; two spark plugs per head; titanium engine mount bolts; special upper triple-clamps; 46mm inlet valves made from valves originally installed in Chrysler hemis; fancy pushrods; fancier connecting rods; and 93 bhp, measured at the clutch. Gietl's right arm was bandaged. He had taken one of the bikes out on the street, and it had come over backwards on him.

Yet we were insulated from despair by the certain knowledge that we had done all we could for our Ducati. And after all, we had all those spare parts and sleepless nights as amulets against disaster.

There is no earthly reason why our 883cc Ducati recorded the fastest trap speed of all the bikes in the Production class. I am not being coy about this—I simply don't know. We had anticipated that the Z-1s would be recording speeds in the 155-mph range; Wes Cooley's Yoshimura Kawasaki, the fastest Z-1 on the track, went 144.9. Gary Fisher had the fastest of the three BMWs, which logged in at 144.6. The Ducati went 145.2, chugging around the high banking at 8200 rpm. Phil and I were surprised and delighted.

Certainly speed traps do not reflect either lap times or winning potential. But the Daytona numbers showed that we had built a decent motorcycle, and we rejoiced in that. We also rejoiced when Daytona was done in the fact that none of the spare parts we had brought were needed, and that total maintenance (beyond changing tires) consisted of fiddling with jets, changing the rear sprocket once, resecuring the oil cooler and rebuilding a shifter mechanism that was acting up.

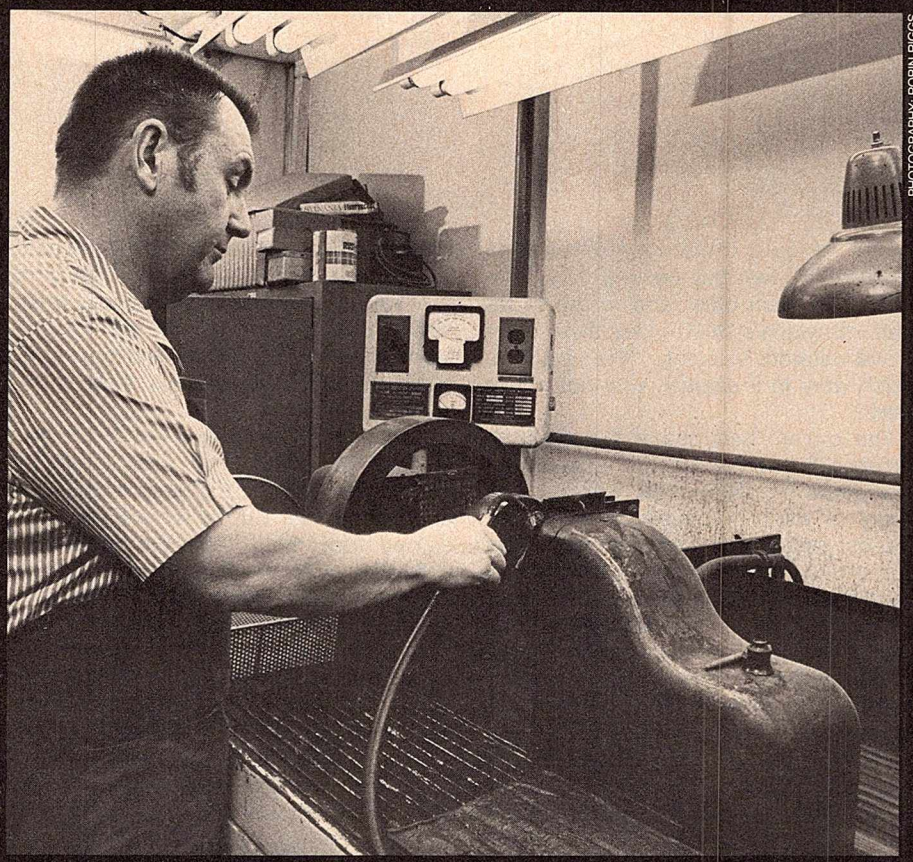
"We've disciplined ourselves to segregate more accurately the *real* from the *hoped-for.* Nothing divides the two more emphatically than racing, yet we have discovered racing to be a haven for the mythic masquerade."

The Ducati didn't win the Production race at Daytona. Steve McLaughlin's BMW did, ahead of Pridmore at the finish line by half a wheel. The Duck was third, two seconds back. Its fastest lap was identical to the fast laps recorded by the BMWs. At one point four of us were running dead abreast down the back straightaway, the Ducati taching 8600, or 149.9 mph.

I suppose that considering its speed, its handling and its extraordinary rideability, the Ducati should have done better. But this ignores the differences between me and the BMW riders. Fisher, Pridmore and McLaughlin are better in traffic than I am, they know how to use the brakes properly, and they all have a professional talent for maintaining concentration that by Daytona I had not developed, and wouldn't begin to until the final Superbike production race of the season.

The months between Daytona and Riverside were more notable for what Phil and I learned than they were for any great racing success. The Ducati, because of its AMA orientation, was no longer legal for local AFM and CMC Production

(Continued on page 111)



PHOTOGRAPHY: ROBIN RIGGS

BITING THE MAGNAFLUX BULLET

It's not easy to drag your components down to the men with the Magnaflux machine. But once you accept the idea that flaws are better detected than ignored, the rest is simple—and your bike will thank you for it.

● IF YOU READ THE RACER ROAD PIECE you noted frequent references to a process called "Magnaflux," and to our Magnaflux man, Bob Gorsuch. Bob works for the Excello Plating Company in Los Angeles. He has been in the precision inspection business for 23 years, the last five of which have been with Excello, and he has been associated with motorcycles since 1966. He knows what he knows.

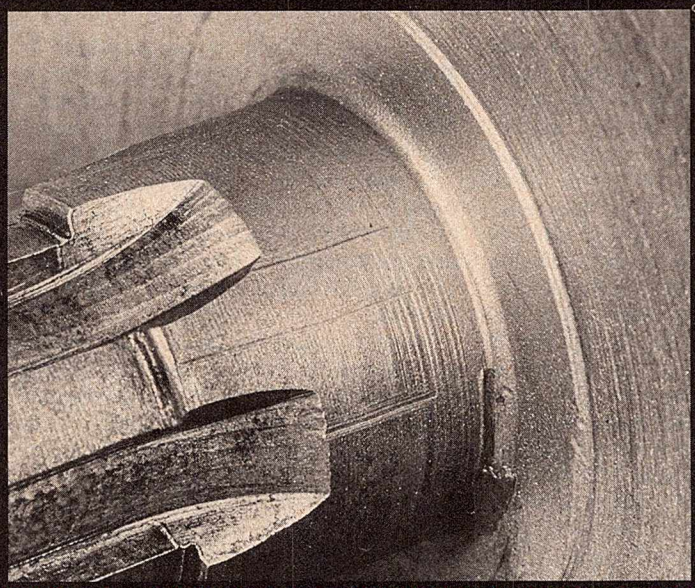
"Magnaflux" is the improper terminology for a process used to detect flaws in components. Magnaflux is the name of the company which manufactures and supplies a good deal of the equipment used by automotive, motorcycle and aerospace inspection companies, and Magnafluxing, like Xerox, has become a generic term. The proper one is magnetic particle inspection.

It is not the only service Gorsuch, and Excello, provide. They do shot-peening; penetrant inspection ("Zyglo"); plating; surface treating; aerospace paint application; stripping; and a host of other activities designed to examine and improve the quality of different metal components.

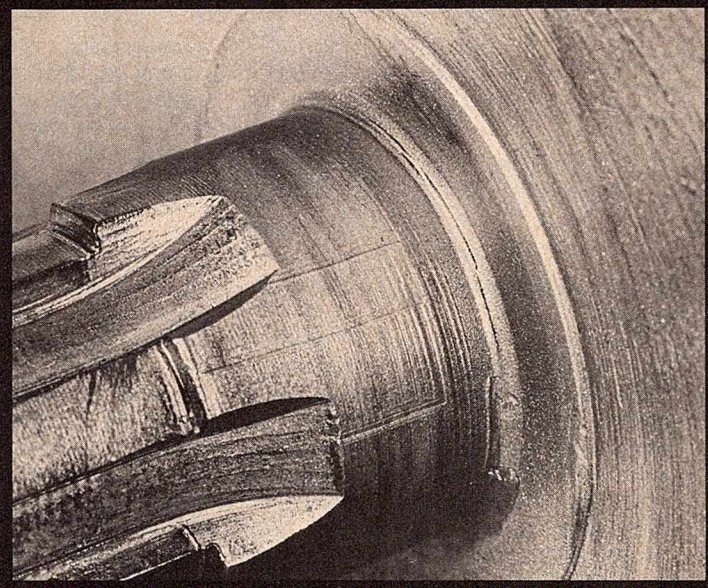
Phil Schilling and I discovered Gorsuch half-way through the 1975 racing season, when it became apparent that some of our Ducati race bike's interior components were becoming mysteriously distressed. Since we availed ourselves of Bob's experience, knowledge and sensitivity about heavily-stressed components, no part that has passed his inspection has failed on the race track—or anywhere else. We have come to rely on him completely to keep our bike, and me, out of harm's way.

Motorcycle people, despite all sound and persuasive arguments to the contrary, seem to be curiously reluctant to subject their bike's components to the kind of careful inspection commensurate with the kind of use those components will see. Such reluctance comes about for different reasons. The most prevalent is, "I don't want to know about it." To assume a factory-fresh component or body of components to be sound is a comforting, and easy, assumption indeed. You've paid all that money for this crankshaft, or those connecting rods, or those valves. They're new, shiny, and they've left their mark on your wallet. If you subject them to careful scrutiny you're letting yourself in for potentially unattractive news: the part or parts are defective and should be replaced. In most cases, hoping a given part is good (in the absence of any certain knowledge to that effect) is easier to live with that taking a chance that it might be bad. Besides, if it does fail, you're always left with the plaintive cry, "damn junk part. It just *broke.*" It is a cry which generally falls on receptive ears, because we've all cried the same thing.

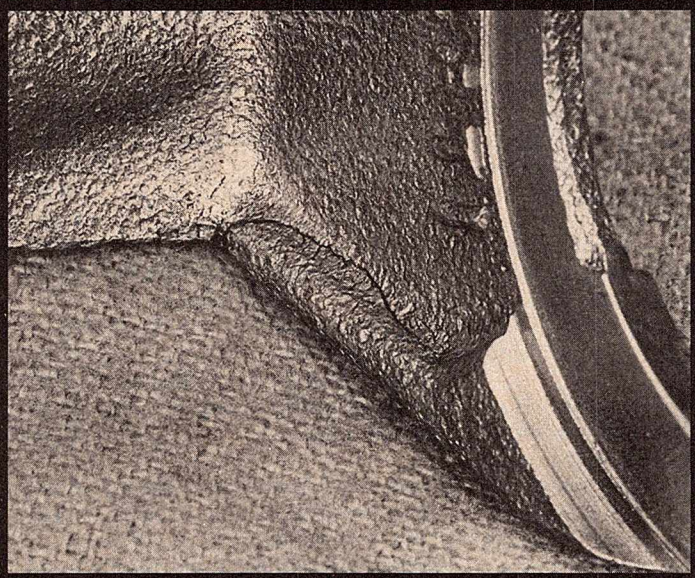
Second, many find the concept and commerce of professional inspection unappealing. You're paying a man (but not much) to tell you exactly what you don't want to hear. Ultimately it is not his job to give his blessing to sound components; he is paid to find flaws, and although his service may be cheap, it has immediately expensive, and time-consuming, ramifications. The defective part must be replaced, and the new one likewise inspected. If the first was also new, you



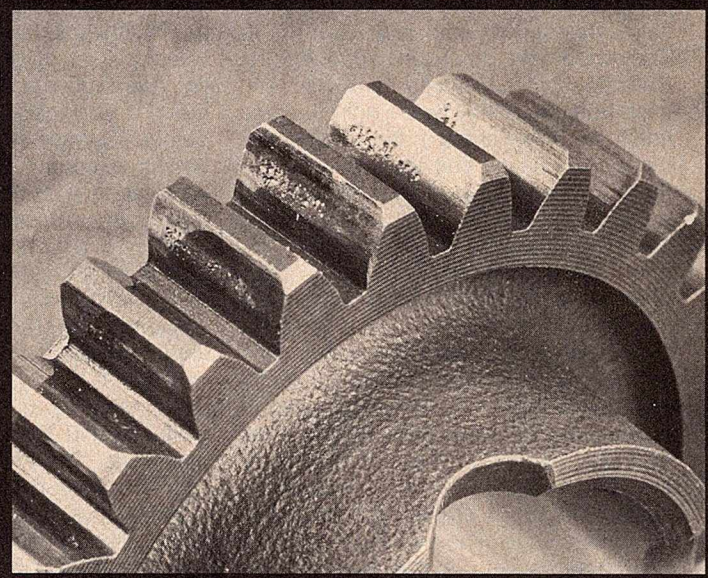
This Triumph crankshaft (above) appears to be in absolutely tip-top condition. The radius between the crank's output shaft and the crank cheek has been peened for clarity and cleanness; the naked eye can see nothing wrong here whatsoever.



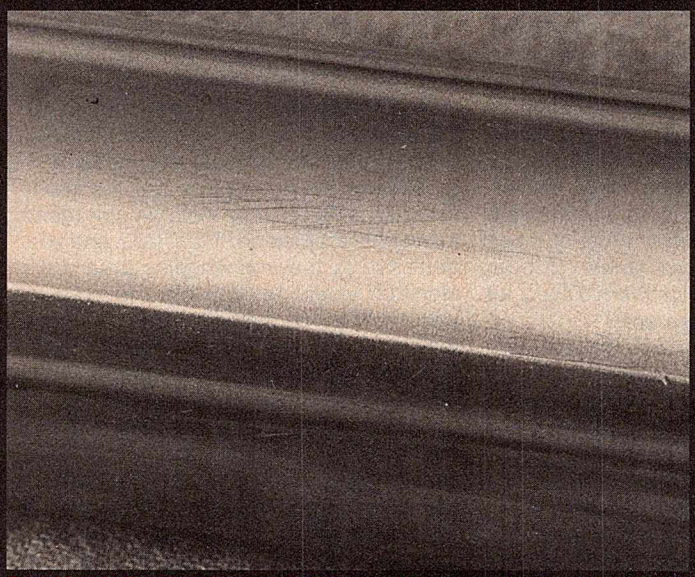
This photograph was taken of the same radius on the same crankshaft—after the magnetic particle inspection process has taken place. The cracks are obvious. If this crank were bolted back into a racing Triumph, it would fail—quickly.



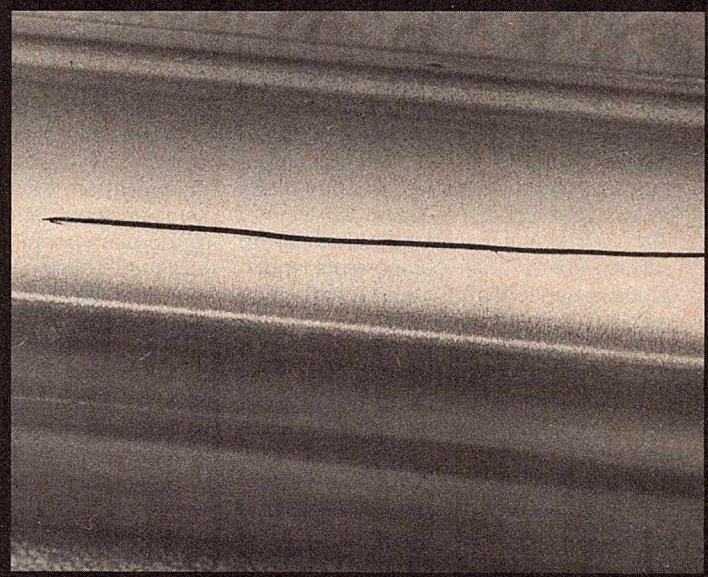
This is a shifter fork from the Neilson-Schilling Production-racing Ducati. The crack you see, likewise discovered by the Magnaflux machine, was caused during the manufacture of the part by metal improperly heated during the forging stage.



This problem wasn't revealed by the Magnaflux process, but it was explained by our magnafluxer. The case-hardening of these gear teeth is popping off, a condition caused by soft base-metal and case-hardening that didn't reach deep enough.



The shiny shaft you see here is Bob Gorsuch's favorite display item. It is part of the landing gear of a WW2 Hudson bomber, and even the closest bare-eye inspection would reveal nothing wrong; it's round, smooth, and apparently flawless.



Wrong again. After Magnaflux a long, deep and dangerous crack is revealed, in the base metal. This shaft was machined out of steel, hard-chrome-plated and then finish-ground to size. It may not have failed in service, but then it may have.

BITING THE MAGNAFLUX BULLET

may not be able to exchange it free for the second.

Then there's the matter of potential guilt. Suppose you have your crankshaft and connecting rods inspected by someone like Bob Gorsuch. He tells you that he has discovered a fatal flaw in one rod. You're left with a decision to make: you either replace the rod, or you live with the knowledge that you have ignored good advice. If inspection is avoided, so too can this possible guilt.

Believe me, I know the feeling, and so does Phil Schilling. After Daytona, we received *gratis* the most beautiful pair of Italian magnesium wheels you ever saw. They were gold, machined to accept the Ducati's front discs and rear disc and cush-hub, and they were light beyond imagining. We wanted in the worst possible way to simply bolt them on and run them. The wheels were manufactured by a reputable builder, and were used in Europe by practically everybody. We suffered. We argued, and discussed. "Suppose we send them out to have them inspected, and they fail?" we wondered. "Suppose we bolt them on, and they fail—*on the track?*" Finally, gritting our teeth, we shipped those beautiful mag wheels to an aerospace X-ray lab and hoped for the best. We heard the worst. The wheels, those beauitful, sensual things, were loaded with dross, cracks, inclusions and micro-shrinkage. The inspection bill was $90. In agony we decided against using them, and ordered up a set from Elliott Morris of Morris Mag fame. His wheels are all inspected. We used them. The Italian ones are in my office, serving as decoration. Every time I look at them it hurts.

Once you have learned to accept the often-unpleasant conclusions of a professional inspector, curious things begin to happen. You find, as we did, that components which pass Magnaflux do not break at awkward times. You begin to discover that your inspector will do all he can to salvage questionable components, and to process new ones to guard against their demise. You will find that he will learn more and more about the character of a part the more he inspects it, and in short order will be able to anticipate with great accuracy when it will fail. And you will begin to feel better about wringing your engine's neck, because you will *know*—not simply assume—that the components whizzing around down there are sound ones and not likely to disintegrate under heavy loading.

The particle inspection process itself is nothing magic, or mysterious. "It'll work on any part that is ferro-magnetic," Bob explained, "any part that a magnet will stick to. You magnetize the part with DC current. At the same time the part is being energized, a liguid is flowed over it that contains iron oxide particles. They're attracted magnetically to any discontinuity in the metal, and show up as a distinct, black line. You have to learn which kind of magnetism to use on which part, and where to look for the crack. Depending on the amperage (as much as 5000) the machine can pick up defects up to ⅛-in. below the surface." For parts made of aluminum, Bob uses penetrant inspection, also known as "Zyglo." The part is bathed in a fluorescent solution, washed, and then inspected under a black light. Wherever the fluorescent solution has penetrated a crack, it shows up hot and clear under the light.

Shotpeening is a process which relieves built-in surface stresses by bombarding the surface with a stream of high-velocity steel or glass particles, leaving tiny, hemisperical dents which pack the metal's surface molecules tightly together. "Surface stresses are what cause cracks," Gorsuch explains. "Nothing else can cause a crack. You incur terrible surface stresses in a part when you manufacture it. When you relieve those surface stresses, you reduce the possibility of a crack starting. People say, 'gee, it's only a *surface* crack.' But that's the worst kind. You can't start a crack on the inside of a part."

We have been hanging around Bob Gorsuch and Excello Plating for more than a year now, and have come to appreciate the wisdom which experience and interest have given him. He makes his living peering at metal parts, knowing where to look for trouble, projecting probable useful life, and prolonging it with all the tools and treatments at his disposal. His enthusiasm for motorcycling makes him doubly valuable; but his connection with our sport has made him suspicious, and skeptical. Here is a sampling of what we have come to call, "Gorsuch-isms":

"A new part is a dangerous part. Ninety percent of the failures I see are caused by parts that are flawed when they are assembled, new, at the factory. I call 'em 'pre-broken parts.' Luckily, most of these parts are designed ten times stronger than they have to be, or there'd be a lot more failures than there are."

"In my opinion there are very few people who know how to do anything right. Most of the ones who do are in the automotive industry. The dummies have graduated to the motorcycle industry."

"Motorcycle people are impressed by things that are bright and shiny."

"Motocrossers break transmissions because the parts are too light to begin with. When a motocross racer brings parts in here I tell him, 'Let's clean 'em up and leave 'em stock, and get *yourself* in shape.' Don't worry about power, 'cause it isn't going to make any power anyway. Most motocross bikes are made so lousy that the main thing is to get them to last."

"I think the best basic materials are used in Harley-Davidsons. Most other manufacturers use a cheaper material and case-harden it to make it effective. The overall finish on parts is best on Hondas."

"Next to pre-broken parts, most failures are caused by dummy mechanics. The most typical dumb thing a dummy mechanic does is reassemble components without checking them to see if they're dimensionally correct."

Considering that services offered by people like Bob Gorsuch can produce quantum leaps in component durability and reliability, it would be fair to assume said services are expensive. They're not. In fact they are astonishingly inexpensive. Some typical prices, from Excello's own price sheet:

Magnaflux or Zyglo Inspection	
Crankshaft	$3.00 to $6.00
Connecting rods complete	$1.25
Pistons	$1.00
Valves	$0.30
Rocker Arms	$0.50
Cam shaft	$1.00
Complete 5-speed transmission	$8.50
Shot Peening	
Crankshaft	$7.50 to $15.00
Connecting rods	$2.00
5-speed transmission complete	$10.00
Timing or transmission gears	$1.00
Bearing cages	$0.50

If you are halfway serious about either your street bike or your racer, I cannot think of any service or group of services I would more emphatically recommend than those offered by Excello Plating, and if that sounds like a commercial, so be it. And talented as Bob Gorsuch is, he would be the last to suggest that he's the only metal inspector in the world. There are in fact lots of inspection stations in the United States, many of them certified by USAC and NASCAR. If you have difficulty finding your friendly local Magnafluxer in the Yellow Pages, simply ask the most successful automobile mechanic or racer in your neighborhood. If that fails, and you don't live in the Los Angeles area, Bob Gorsuch would be delighted to receive your work in the mail and return it in the mail. The address: Excello Plating, 4057 Goodwin Avenue, Los Angeles, Cal. 90039 or telephone 213-245-3626.

As I said earlier in the story, much of the credit for our Ducati race bike's solid season must go to Gorsuch. He can do the same thing for your bike, whether it's a motocross racer, dirt-tracker, street bike, canyon racer, café racer, Baja racer or play-racer. Count on it.

—Cook Neilson

LETTERS..... *Continued from page 11*

cle. Mr. Emmons is finally beginning to get the work he deserves.

I met Mush at a San Jose Mile a couple of years ago. I was impressed with his casual, almost sloppy, attitude. He is obviously much more interested in making good pictures than in being one himself.

Torrey J. Heeb
Oakland, California

COMMENTS ON CHAIN

Reference *Cycle's* comments concerning our Morse Hy-Vo chain in the Kawasaki KZ 650 (November issue):

Our chain is an engineered product. It is designed, as are all the other engine components, to handle engine requirements in an efficient and reliable manner. We know that there have been some chain failures in racing applications. As an example, the Honda CB550 chain design parameters were 50 bhp at 9000 rpm. With some wizards like "Pops" Yoshimura extracting outputs like 90 bhp at 11,500 rpm, the chain is being worked far beyond its design limits. Any time you modify an engine, other components must be changed—there is always a limit, a fusible link, in the total system. Stock pistons and connecting rods can be replaced by better racing units—unfortunately, you cannot buy a better chain than our Hy-Vo! The only solution to increasing Hy-Vo's capability is to increase the width or pitch of the chain and this, of course, is virtually impossible on the multis with the chain in the middle of the crank.

I am sure you are aware of the classic production cost vs. performance tradeoff, so I won't bore you with any more of this except to say that we can design a Hy-Vo chain drive that will handle any requirement for power transmission.

Roger J. Williams
Sales Manager—Automotive
Replacement Market
Morse Chain
Ithaca, New York

OLDIES BUT GOODIES

It's been my experience that we motorcyclists are too quick to expound the virtues of the endlessly-produced, newer, and better bikes, and all too often allow the old favorites to fade into oblivion. True, the new bikes offer more comfort, and more performance, along with the increase of expensive mechanical headaches that seem to be an accepted by-product of advancing technology. But there's something about the crudeness and simplicity of older bikes that makes some of them far outshine any of the latest Superbikes.

To demonstrate this, I ran a 1965 305 Honda CL77 for 30 days without a single major mechanical breakdown. (This was an unrestored bike, with over 70,000 miles on it to start, and the only repairs done during the trip were to the shifter, after a dump). This is of course no sane way to tour the country, but that little motorcycle generated quite a bit of well-earned respect, and nostalgia, from both bikers and four-wheelers. And it proved that even in its lack of sophistication, it was a dependable and hard-riding little machine, worth the expense, now, of restoration back to its original glory.

Needless to say, I've been sold on the craftsmanship and common-sense simplicity of many of the oldies but goodies, since my cast iron relic turned what was dubbed the "impossible odyssey," into the "infinite dream."

Fred Scalise
E. Longmeadow, Maine

SAVE A BUNDLE

This is in answer to Mr. J. W. Dowell of Pana, Ill. His complaint concerning a parts rip-off appeared in "Letters," December, 1976.

We here at Yamaha of Norfolk will be happy to sell Mr. Dowell any parts at the suggested retail prices, which I have included for comparison.

His Dealer		Yamaha of Norfolk
$12.75	Head gasket	$5.08
9.13	Cyl. stud	1.80
4.75	chain link	1.00
6.85	valve gasket	5.52
4.20	point cover gasket	.30

Unfortunately for us all, there are many dealers who will gouge the unaware public. Mr. Dowell can order from us, and even paying UPS or Parcel Post rates, save a bundle. I'm sure there are many Yamaha dealers who would be happy to serve Mr. Dowell, and at the same suggested retail prices.

E. Collier,
Parts Dept., Yamaha of Norfolk
Norfolk, Virginia

BLUSH, BLUSH

I have been reading your magazine, along with all the other cycle books, for some time now, having followed motorcycling for over a quarter of a century.

The quality of the writing in your review of the BMW R100RS (December) is up to the best standards of magazine journalism anywhere in America. The language is as exciting and as bold as the product concept itself. It is fresh, always surprising in its choice of words and pursues its point of view with a great roll-on of style and verve.

Being a holder of an M.A. degree in English language and literature, founder and creative director of an award-winning ad agency, and published writer, I feel I have paid my dues in a good many places and times. Therefore, it gives me extreme pleasure to praise professionalism when I discover it, as I so frequently do in the pages of your superb publication.

Ron Levin
La Verne, California

Address correspondence to: Cook Neilson, "Letters," CYCLE Magazine, 780-A Lakefield Rd., Westlake Village, CA 91361.

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Review

The Story Of Triumph

● HOW IRONIC IT WOULD BE, we have thought at *Cycle,* if the last motorcycle built in England was the Triumph Bonneville. The Triumph Trident has gone; Norton Commando production has stopped; the big AJS and Matchless and Ariel motorcycles have long since been laid to rest. Through the years the Triumph 500, 650 and 750 twins have been the revenue-wells of the British motorcycle industry. The bikes were the archetypical British vertical twins. From the late 1930s forward, they were successively the moneymakers for Triumph Engineering, Ltd., and then the Triumph division of the BSA Group, and presently the Meriden workers' co op and NVT.

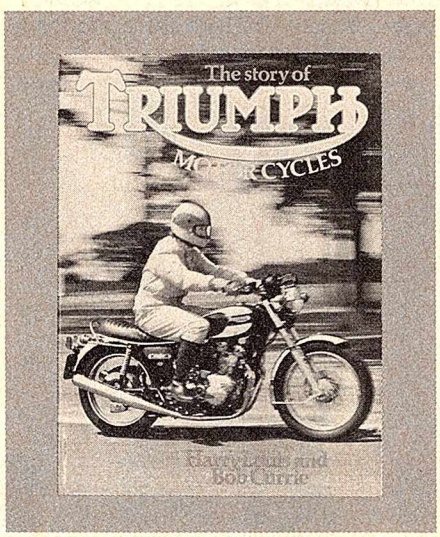
No other motorcycle ever worked so well for Triumph as the vertical twins, and when the factory tried other alternatives—some daring, others conservative and still others foolhardy—circumstances conspired against the new projects, and seemed to demonstrate that no motorcycle would ever serve Triumph so well as the vertical twins.

For journalists writing company histories it's easy to see this past as inevitable, and difficult to present the years gone by as full of choices, pivotal decisions and missed opportunities—as well as right choices at right times made by the right people.

The Story of Triumph (Patrick Stephens Limited; Cambridge, 1975) by Harry Louis and Bob Currie is a close British history which avoids treating the past as inevitable or the British vertical twin as a sacred cow. (The $14.95 book is available from the North American Publisher/Distributor Haessner Publishing, Inc., Newfoundland, N.J. 07435.)

A close British history is one that establishes a precise chronology of men and events and motorcycles, recites every model number, offers charming anecdotes, publishes photographs of significant models, prints exploded-view line drawings of important engines and bikes, names all names and reviews all racing victories and records all lap times. This *The Story of Triumph* does, just as one might expect in a book written by two veteran motorcycle journalists. They cut the Triumph past up into 24 chapters, covering everything from "The Blitz and After" to the "ISDT."

Authors sometimes bury their readers under an avalanche of facts that obscures any analytical topography. Louis and Currie present a vast array of factual material, but they have not neglected to say what it may all mean. There are some areas of particular interest to Americans. "The American Connection" deals with the entry and expansion of Triumph into the United States. Traditionally, it's been held that the Speed Twin (the Edward Turner-designed 500 vertical twin introduced in 1937) brought prosperity to Triumph. But to be more specific, the Turner twins *and* the American market made Triumph rich.



By the end of 1946 some 500 machines had been exported to the United States, where enterprising Bill Johnson, the West Coast importer, had discovered a growing market for an English-style motorcycle. British investigations verified the potential, and by 1950 Triumph had set up its factory-owned branch in Baltimore. Imports grew to £680,000.

Many things suggested the crucial importance of the American market. Item: Triumph representatives had to fight off the possibilities of tariff restrictions, urged by Harley-Davidson in 1952. Item: by 1954 the value of machines shipped from Meriden went over £1,000,000 in the days when the pound sterling was worth a lot. Item: Triumph launched their 650cc twin in 1949. "And the name, straight from the mythology of the North American Indian, was Thunderbird." The name indicated the origin of the bike. "The background to its introduction was a clamour from the fast-expanding United States market for a more powerful machine than the then-current 500cc twins, capable of sustained high speeds on the fast, smooth highways of that continent. Turner's answer was, in effect, an enlarged Speed Twin." The Tiger 110—a 650 sports version—soon followed, known as "the Bonneville," a buzzword for Speed and Power in America.

The money rolled in. "Average annual profit for the 20 years, 1950 to 1969, was no less than £644,000. This was a magnificent achievement. It has probably never been approached by any other manufacturer in the 75-year history of the British motorcycle industry."

Triumph was riding the crest of a Japanese wave. In the United States, those who bought little Japanese motorcycles "looked around for something more powerful, and Triumph filled that need—for awhile. Shortly the Anglo-American connection was in jeopardy. " . . . from 1965 onward, Japanese manufacturers were expanding successfully into the larger engine section of the market. The severity of the competition, the failure of the BSA group to introduce acceptable new designs, and the withdrawal from top management of the former team began to show."

The British motorcycle industry, including Triumph, was in trouble from 1965. Mistakes in the late 1960s and 1970s may have compounded difficulties, but the vital Anglo-American connection began to break apart after 1965. After that, time worked against the British. Even with all-new products, the British would only be playing a catch-up ballgame.

What the British motorcycle industry needs now, the authors conclude, is a rescue effort. Only a massive infusion of capital from the government for new equipment and new motorcycles will give Triumph history a future tense.

But for now, the past and present still converge at one point: Bonneville. ◉

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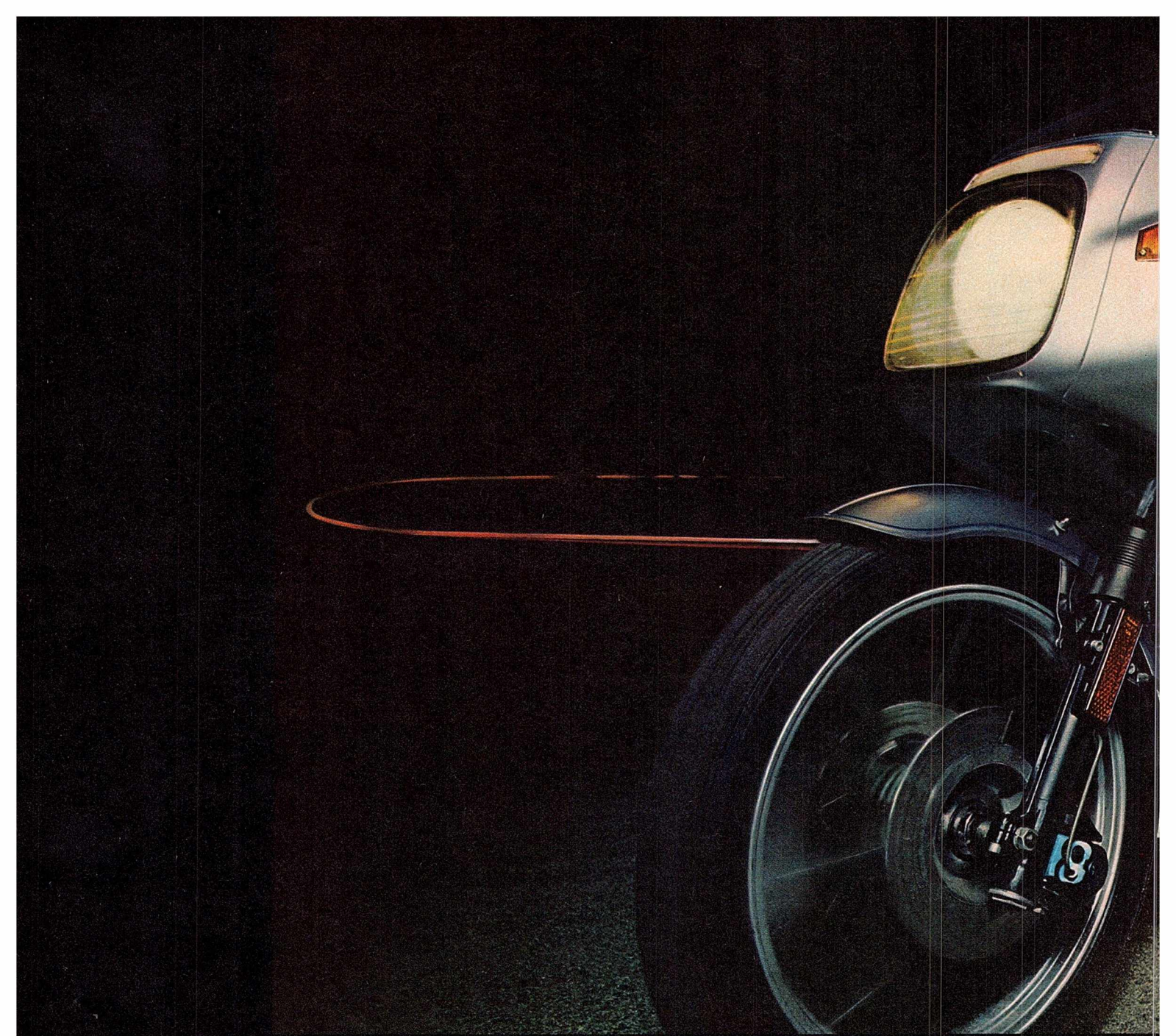

"Suddenly an awful lot of bikes look awfully old-fashioned."

This, riders, is the new BMW R100RS. And if you think it looks great in this picture, picture yourself pulling up to a light on it next to a group of ordinary bikes.

Of course, BMW doesn't just design a motorcycle to look great. We design a motorcycle to work great, too.

Our unique, frame-mounted Integral Cockpit Fairing, for example, was designed in the wind-tunnel to be a functioning part of the total motorcycle. Not an afterthought. What results is a kind of streamlining that does more.

You'll notice the spoilers in the mid-section. And a smooth, flowing surface that starts below the covered headlight and continues up over the parking light and windscreen. These surfaces combine to create downforce. And that downforce gives the rider better roadholding and stability. Not just at high speeds, but at all speeds.

At the same time, the Integral Cockpit Fairing makes the RS very "slippery," aerodynamically-speaking. So it doesn't have to work as hard to give you top performance.

And performance is something the RS has plenty of. The major reason, of course, is our new 1000cc engine. But to make that engine even stronger, we've given it

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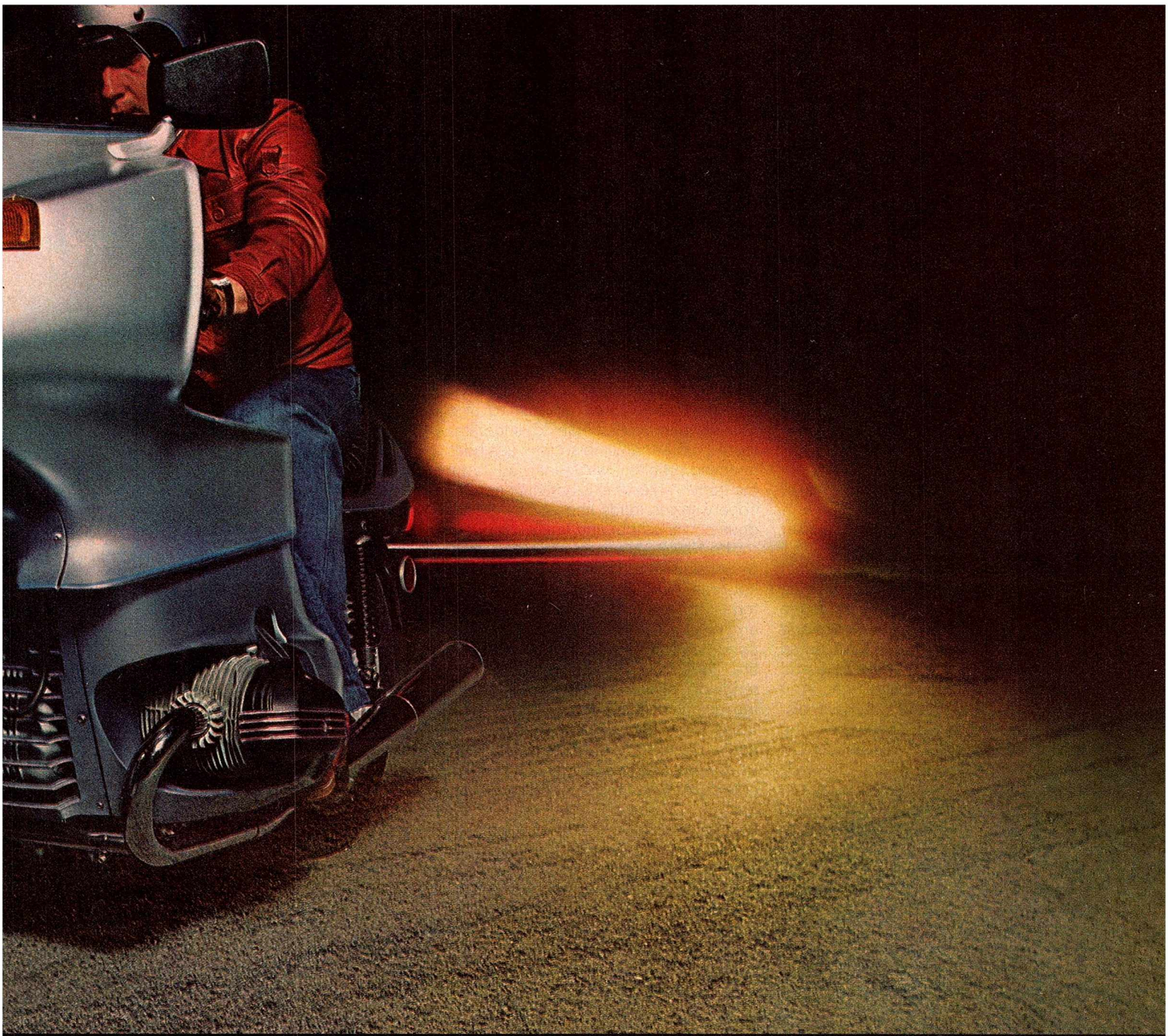
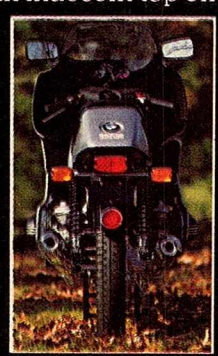


larger valves. Brand new, super-efficient 40mm Bing carburetors. A new crankcase housing. New cylinder head design. The result? Mind-boggling low and mid-range torque. And an indecent top end.

The R100RS is as unique inside its Integral Cockpit Fairing as it is outside. The top of the steering head is carefully padded for safety. All instruments are matte black so reflections won't break your concentration.



On the RS, it's your choice. Our new 3/4 racing-type seat. Or the "S" dual seat.

The RS comes with color-coordinated rims individually pin-striped to match the distinctive blue trim on the bike itself.

Standard on every 1977 BMW motorcycle is a new 12-month, unlimited mileage guarantee. And also standard is that special attention to quality and detail that has always put the BMW motorcycle one large cut above the competition.

Go to your local dealer and see the new R100RS. Look over our R100S, R100/7, R75/7, and R60/7 bikes, too. With their new colors and many new features, there's nothing like them. And there won't suddenly be anything like them in the future either. Because BMW stands alone. U.S. Importer: Butler & Smith, Inc., Norwood NJ 07648/ Compton CA 90224. Canada: BMW Motorcycle Distributors, Ontario. Write for our colorful free brochure.

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KAWASAKI Z1/KZ1000 CHASSIS TUNE

It is possible to make Kawasaki's big four handle almost as well as it goes in a straight line.—by Gordon Jennings

● EVEN RIDERS WHO ARE DEEPLY ENTHRALLED with the Kawasaki Z-1 will admit that the bike's appeal rests mostly in its incomparable straightaway lunge. Those who buy the new KZ1000 will also get a lot of suspension compliance, vibration and noise control refinements—and the same tendency to bob and weave on twisty roads, like a boxer facing a difficult opponent. Nobody enjoys that side of the big Kawasaki four's character and many corrective attempts have been made, most involving suspension tuning and few accomplishing the desired transformation of its handling.

Better shocks and somewhat softer rear springs are known to help the Z-1's handling and should have the same effect on the KZ1000. Its manners can also be smoothed a bit simply by careful attention to the fork: getting the tubes parallel and making sure the sliders aren't subjected to any binding loads when the axle and fenderbrace bolts are pulled tight. And those who road race the Z-1 have discovered that it is unusually sensitive to the condition and alignment of its wheels. Let a few spokes get loose, or cock the rear wheel a couple of degrees off-center in the course of adjusting for chain wear, and there will be a marked deterioration of the bike's handling.

The measures just outlined are laborious, but should be considered a must by anyone who owns a Z-1 or KZ1000 and knows the temptation to ride hard is apt to be overwhelming. Unfortunately, those who do yield are sure to find that straightforward chassis tuning is not enough. You can get the big Kawasaki's wheels perfectly aligned and its suspension perfectly damped—and it will still occasionally misbehave when worked hard. You may have nudged the threshold of cornering wobble upward a few miles per hour, but it's still going to be there and the Kawasaki's worst handling trait, which is a rubbery wallowing around under very hard braking, won't have been diminished at all. That's when you'll begin to understand there's more than limp shocks behind the handling problem; we've learned that it's the frame, which just is not stiff enough to cope with the loads imposed by tremendous power output and really hard riding.

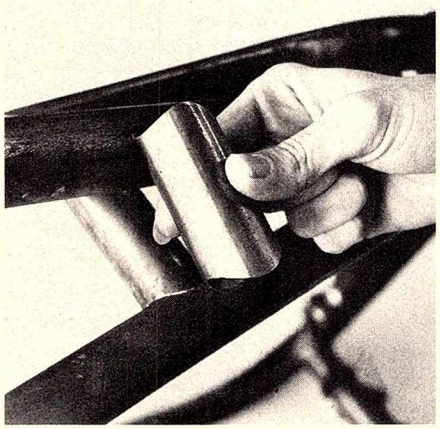
The Kawasaki's frame flexures should be considered as having two fundamental sources, and assuming two principal forms: the loads fed into it at the swing arm pivot are a mixture of chain pull and cornering loads reflected from the rear tire, felt mostly as a push-pull activity tending to produce a fore and aft shuffling movement of the frame's engine cradle tubes; there also is a very heavy leverage applied by the fork when the front brake is used hard, and this results in a considerable distortion of the steering head's supporting structure. The first of these flexures wags the swing arm and (with some help from sloppy fits at the pivot shaft) would appear to be a major contributor to cornering wobble; flexing at the steering head causes the directional uncertainty you feel when applying a lot of front brake. You'd have to create an entirely new frame to eliminate these flexures but you can bring them within tolerable limits with much less drastic modifications, as some of our associates in Superbike racing have discovered.

Flex at the steering head is diminished by stiffening its supports, just as you'd expect, and a very great improvement is to be had from the addition of remarkably little metal. Pierre DesRoches, who is a much-imposed-upon Friend of the Staff and a preparator of racing Z-1s, says you can better the bike's under-braking steadiness by several orders of magnitude with the triangular bracing shown in the accompanying photographs. It might seem odd to add braces almost a foot away from the steering head, but that's where they're needed. Pierre clamped a bare Z-1 frame to a heavy steel table, stuffed a length of pipe up into the steering head and pushed. This placed the frame under the same kind of load it gets from brake reaction, and although the force Pierre applied was much lower than that created by braking it was enough to make the frame flex. The frame's top tube bowed upward; those just below were forced apart. Pierre then welded in a horizontal brace to keep the frame's tank rails from spreading apart, and two more tying them to the top tube—which was then prevented from bowing.

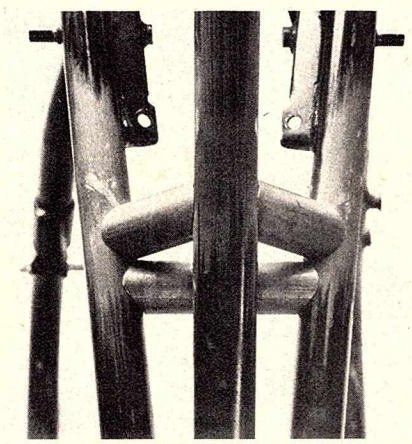
The above modification is best done with short pieces of steel tubing carefully "fish-mouthed" to fit where they join against the frame tubes, and the welding done with the engine out of the frame. But very nearly equivalent results may be had by using steel strap, which can be welded

(Continued on page 116)

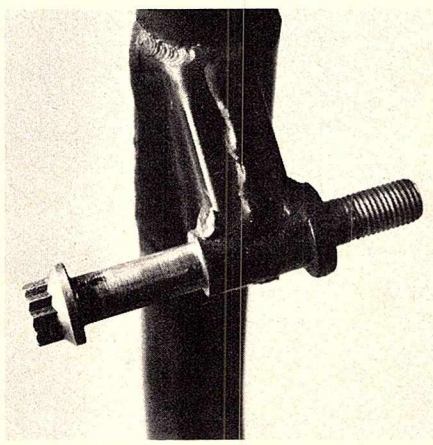
PHOTOGRAPHY: PAUL R. HALESWORTH



The top-brace tubes' ends are trimmed to fit perfectly between the frame tubes, then welded into place.



A triangular brace linking the frame's top tubes reduces flex and thus steadies the bike under braking.



The Z-1's engine can be made to brace its frame by using tightly-fit, oversize, aircraft-quality bolts.

The Shop

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Until you've been on a Harley-Davidson, you haven't been on a motorcycle.

We believe in safety first. Before you start out, light your lights, put on your helmet and watch out for the other guy. Follow owner's manual for maintenance.

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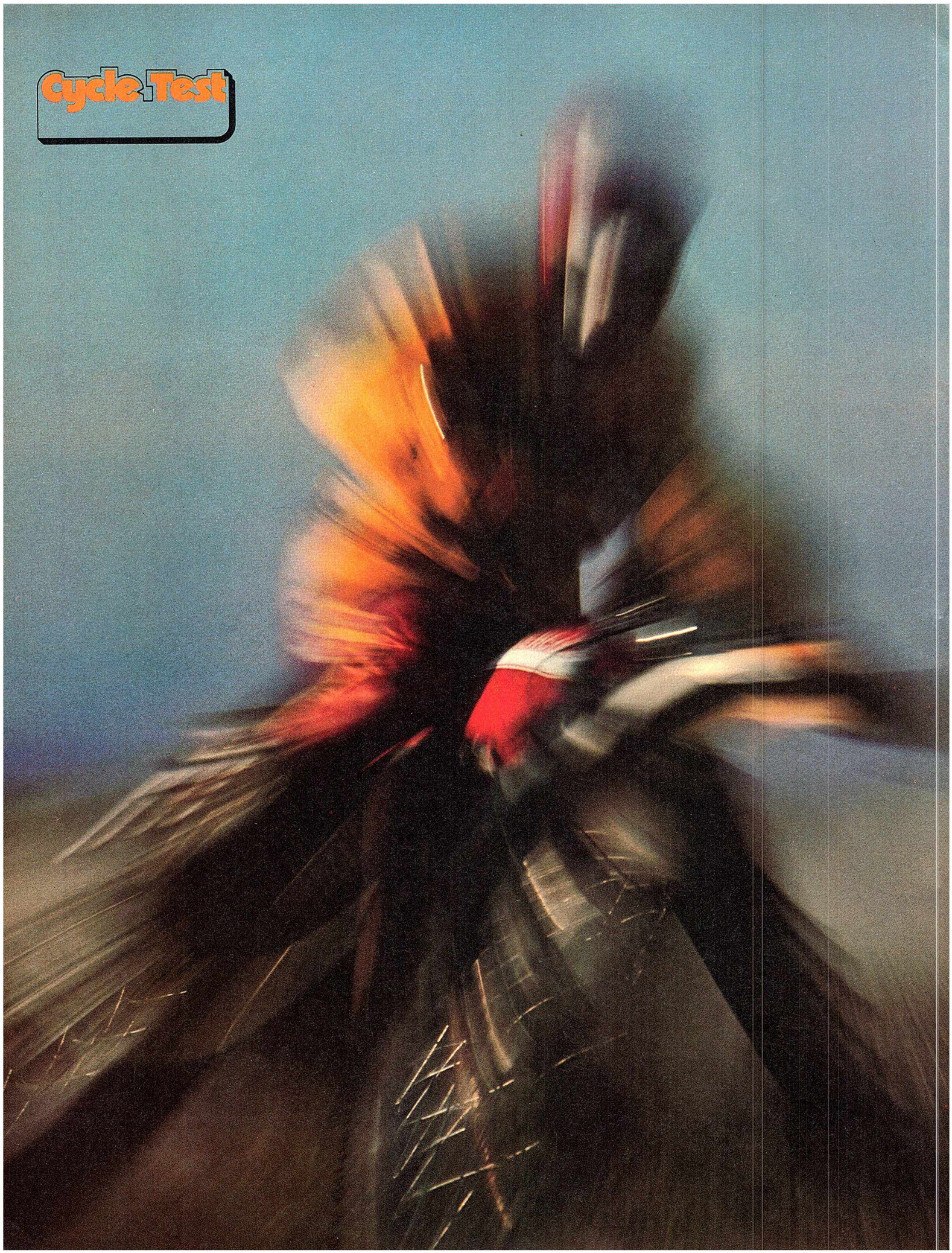
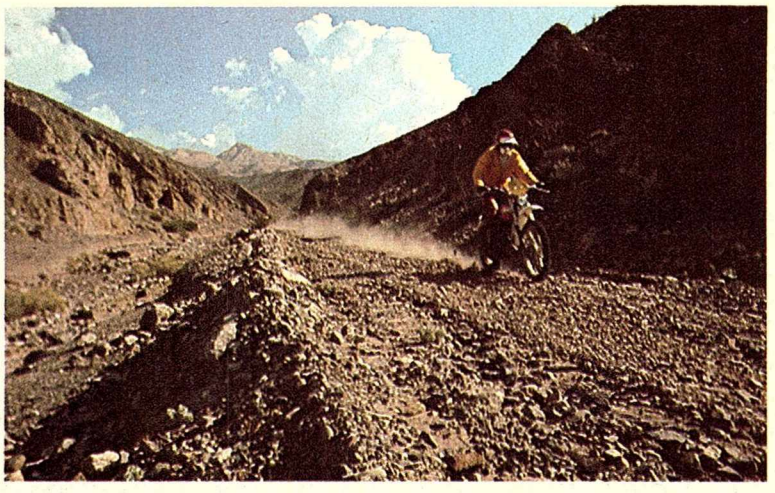

Cycle Test

HERCULES 250 ENDURO



Germany's 7-speed shot is aimed at the carriage trade of trail riders--- those who demand and will pay for ISDT performance. After the factory clears up a few problems, it will hit KTM and Husky between the eyes.

● Late last summer *Cycle* published the first American road test on a 175 seven-speed Hercules, and stated flatly that it could be the best enduro bike in production with certain refinements. Here is another exclusive Hercules test, this time a 250, and the same basic conclusion remains. The need for refinements, however, is significantly more evident with this bike than the 175.

Such is the case for several reasons: In the first test, the bike was different and new, and we were caught up in the discovery of a genuine ISDT machine for serious enduro riders. Preoccupied with the mystique of its seven-speed gearbox and near-perfect steering, we dispatched a missed shift here and a little vibration there with a sentence or two; probably just a quirk of the test bike. In this test, however, greater familarity generated greater objectivity. Confronted with the same problems on the 250 that occurred with the 175, we can only conclude that they weren't idiosyncracies of our particular 175, but inherent difficulties for the whole Hercules line.

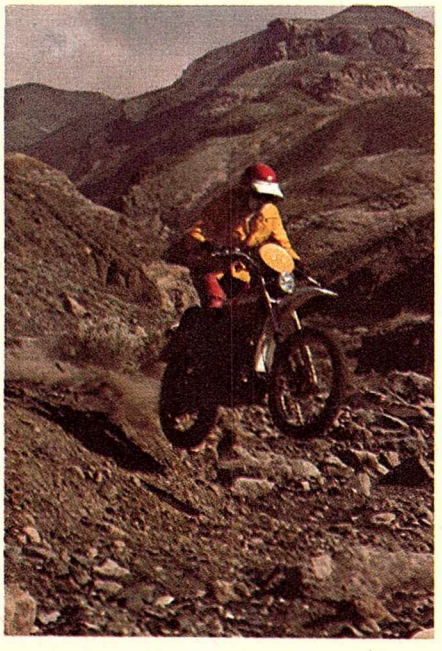
This situation is unfortunate, and somewhat serious. There are four major problems—vibration, missed shifts, rear-brake hop and excessive fuel consumption. The factory is presently at work on cures, and solutions should reach production models by the time 250s are readily available in America. Indeed, several improvements appeared on the 250 in the three months separating our two Hercules tests, so it's clear the factory has the capability to correct defects with haste. But *Cycle* doesn't road test future models. The machine we had will have to take its knocks. In the end, however, it delivered superior overall performance, which overshadows most of the problems and lavishly enhances its future potential.

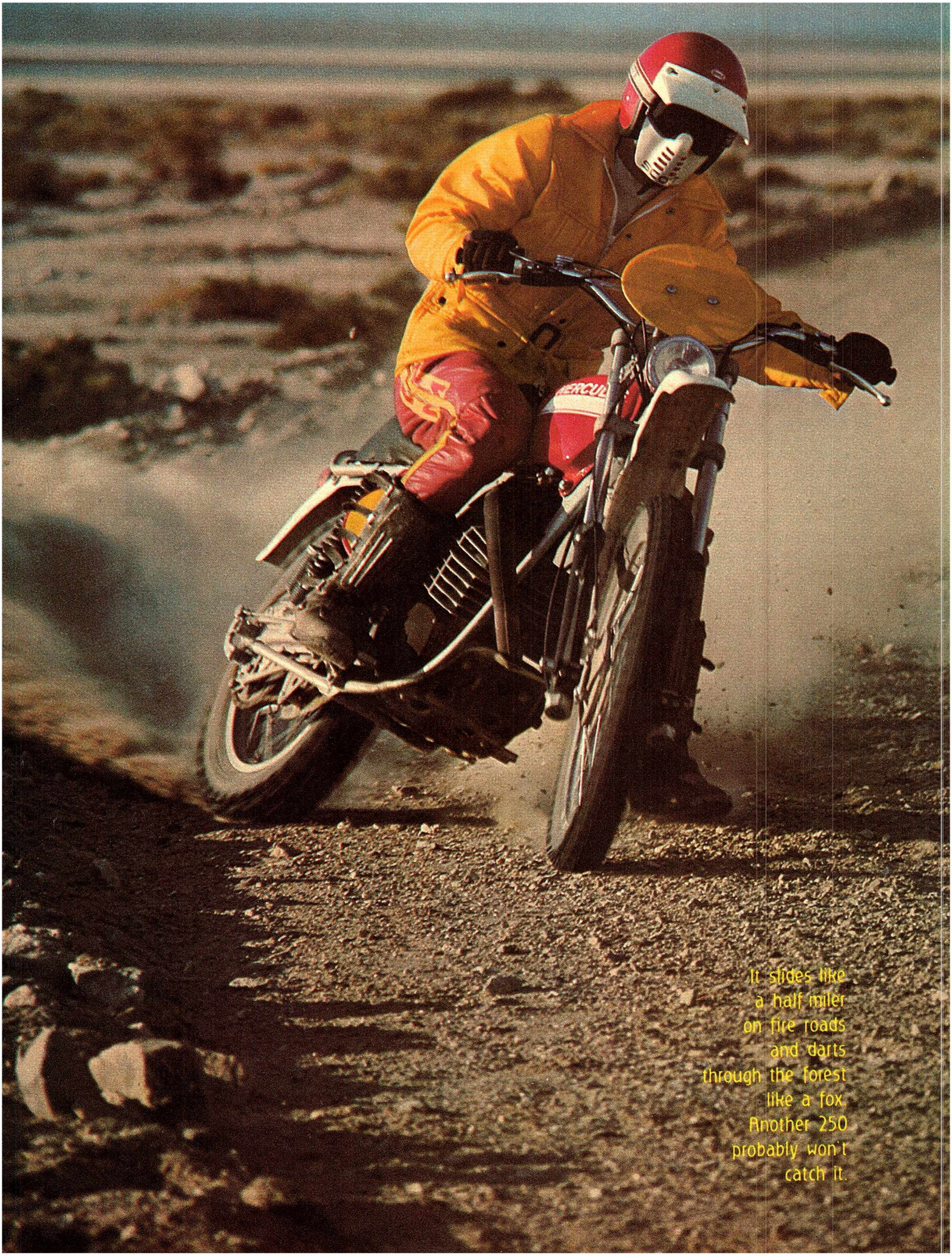
But first the bad news.

Vibration: On the powerband the Sachs engine shook enough to (1) intrude upon the rider's concentration, (2) fracture two motor mounts, (3) crack a horn bracket, (4) render the taillight bulb inactive and (5) jeopardize the life expectancy and accuracy of enduro clocks mounted on the handlebar. The bike vibrates as much as any open-class motocrosser, which is a lot for a 250 and something that Sachs must resolve.

Missed shifts: It happens most often between first and second gear when you're on the power and shifting hard—just when you need a crisp shift the most. Many times it took two tries to climb a hill because the first charge ended in a hopeless loss of momentum and an over-revved engine when neutral was snagged instead of second. Most gears are missed when upshifting, and the frequency is several times an hour on an average trail ride.

Rear brake hop: All off-road motorcycles suffer some degree of clatter-bang-hop while braking hard on rough terrain—especially on rocky downhills. This prob-




It slides like
a half miler
on fire roads
and darts
through the forest
like a fox.
Another 250
probably won't
catch it.

lem is aggravated to an especially noticeable level on the Hercules by (1) a rod-activated brake instead of a cable, (2) too-stiff shock springs, (3) a non-floating backing plate and (4) a high friction coefficient between the brake shoe and brake drum. Hercules' new motocrossers already have a fully-floating brake, and it would be wise for them to incorporate it on the enduro immediately.

Fuel consumption: Mileage is an abysmally low 15–22 mpg, depending on how hard you ride. Range from the 2.6-gallon tank is an unacceptable 35 miles when riding hard and 40–42 miles at leisurely speeds. We ran out of gas on a 48-mile enduro loop and lost any chance of placing the Hercules high in the results. Ironically, our 175 test bike got excellent mileage and had a bigger tank, but the factory recontoured the 250's tank for less knee-crowding and reduced its capacity by a quart, thus compounding the range problem. Hercules will have to improve mileage considerably or offer a larger tank before anyone could expect to finish an enduro or take extended rides with his friends.

In spite of these problems this motorcycle dices with Penton/KTM and Husky for top enduro honors in the 250 class. It gives way to neither in power, and after fork and shock springs are exchanged for something less harsh, it matches both in handling. No Japanese street/trail bike or pure enduro can approach its overall performance.

The cylinder catches everybody's eye because of its huge size and truly different appearance. Enormous fins extend past magnesium sidecovers on both sides and wrap across the head in a flattened sunburst pattern which leaves plenty of room for changing the plug. Vertical noise-control and strengthening ribs cast between the regular fins shield a direct view of the barrel, so everybody bends at odd angles to study the cylinder. "Why is it so big?" people ask. Dyno testing reveals the answer: even at peak power, head temperature refuses to surpass 410 degrees, an exceptionally safe operating level that indicates even a wide-open blast up a sandwash on a hot day won't seize the engine. Rapid heat dissipation keeps horsepower consistent at times when scantily-finned engines lose power.

People next notice the unmistakable similarity to a Penton, especially in the identical method of variable shock mounting. This enables the No. 3 Marzocchi shocks (with old-style 10mm shafts) to be positioned five different ways, depending on rider preference. Rear wheel travel varies from 5.9 inches in the laydown shock position to 7.25 inches all the way forward. With stock 120-pound springs, which were too stiff for even our 200-pounders, it was difficult to get a clear read on shock performance. Because of heavy springs on both ends the bike reached its handling zenith at high speed in extremely rough terrain. Huge rolling whoop-dee-doos deep enough to conceal a Toyota wouldn't bottom the shocks or pitch the rear end from side to side. The harder you hit bumps the more the stiff suspension came into its own, but very few riders could stand such high speeds for very long, so softer springs are definitely necessary—especially for enduro work and trail riding. With them the rear end would be close to perfect by delivering more comfort, greater travel and reducing the brake hop problem. The rebuildable Marzocchi gas shocks are highly adjustable and easily serviced. Their action for enduro usage is entirely satisfactory.

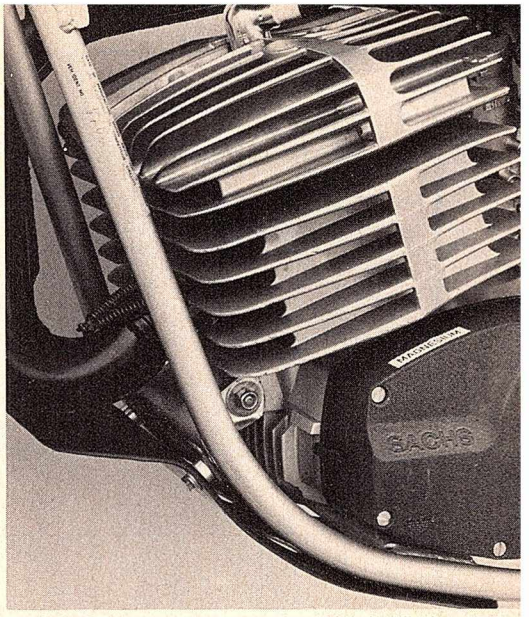
The particular Ceriani fork on the 250 had a much smoother action than the one on our 175. Both required flushing with solvent and proper mounting to begin working right, but once set up, the 250's fork was superb. It had new dual springs separated by an aluminum spacer, but again, the heavier one was too stiff, allowing full travel on only the most horrendous bumps. A bike should bottom its suspension three or four times an hour in a tough enduro to demonstrate that nearly full travel is being utilized the rest of the time. A lighter second spring would make the Ceriani's entire 8.25 inches of travel as supple and cushy as the first four inches, which are controlled by the softer of the two springs. The fork is the latest leading-axle design with a magnesium slider and seals which don't leak. For oil we used 200cc of Torco MTF Fluid, a 10-weight primary case oil which many racers are using successfully in forks.

The next question observers ask is the relationship between Sachs, the name stamped on the engine and hubs, to Hercules, the name on the tank. Sachs is a giant German industrial conglomerate which builds engines, clutches, shock absorbers, hubs, automatic transmissions, washing machine parts, etc. One of their subsidiaries is Hercules, builder of the largest selling line of motorcycles in Germany. Sachs makes the engine and hubs, and Hercules does the rest. The

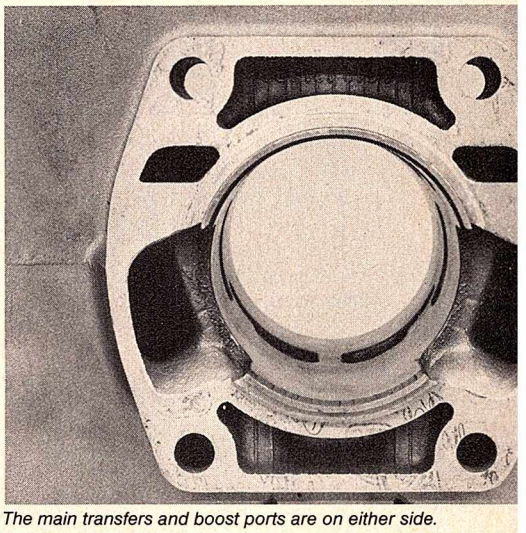
(Specifications page 56, story continued on page 69)

PHOTOGRAPHY: DALE BOLLER

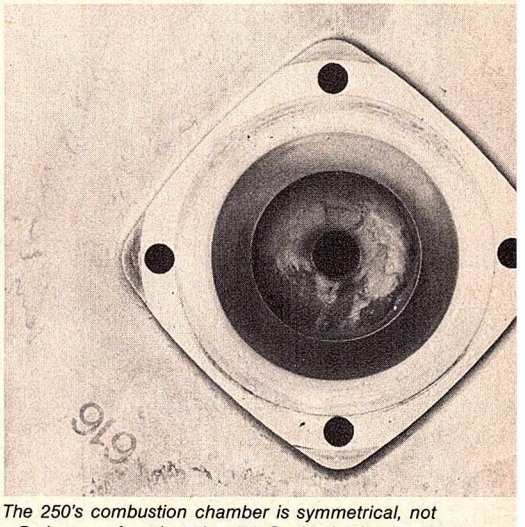
Flat top piston has less surface area to get hot as compared to a domed piston so the engine runs cooler.



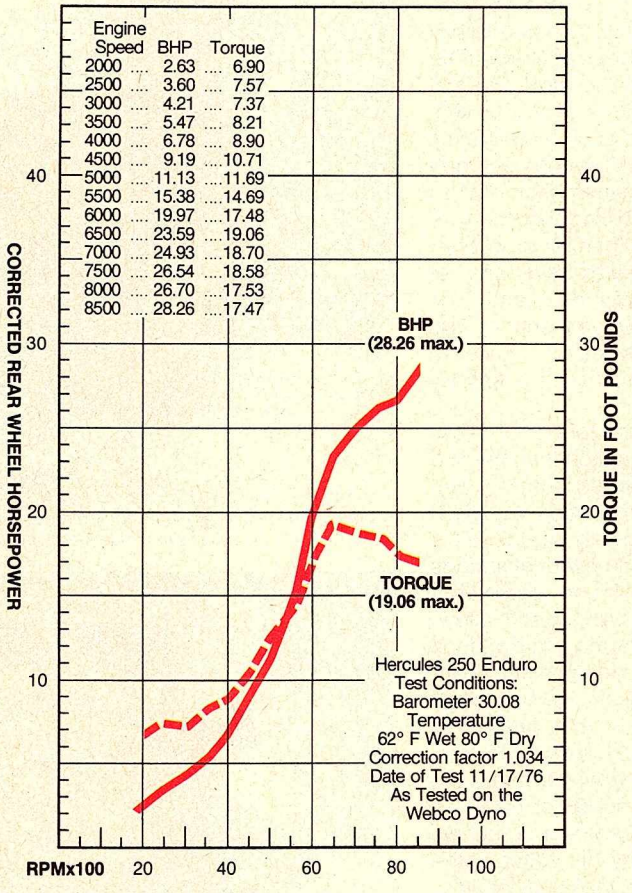
Enormous finning makes most people think the bike is a 400. Cylinder and head are intricate alloy castings.

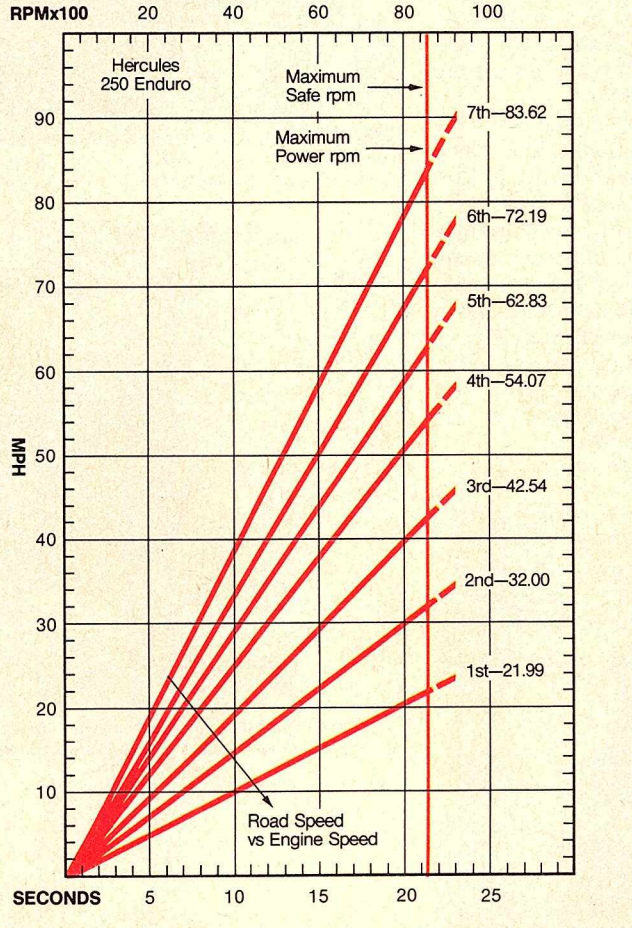


The main transfers and boost ports are on either side. Hollow areas at noon and 6 o'clock merely save metal.



The 250's combustion chamber is symmetrical, not a D-shape as found on the 175. Gasket is aluminum.





HERCULES 250 ENDURO

Price, suggested retail	$1698
Tire, front	3.00-21 Metzeler MX-Enduro
rear	4.50-18 Metzeler MX-Enduro
Brake, front	.95 x 5.5 in. (24 x 140mm)
rear	.95 x 5.5 in. (24 x 140mm)
Brake swept area	32.8 sq. in. (211 sq. cm.)
Specific brake loading	13.14 lbs./sq. in.
Engine type	Two-stroke piston-port single
Bore and stroke	71.5 x 61mm
Piston displacement	245cc
Compression ratio	11.5:1
Carburetion	1; 36mm; Bing
Air filtration	Twin Air wet foam
Ignition	Motoplat CDI
Bhp @ rpm	28.26 @ 8500
Torque @ rpm	19.06 @ 6500
Rake/Trail	28.5°/4.9 in. (124mm)
Mph/1000 rpm, top gear	9.84 mph
Fuel capacity	2.65 gal. (10 liters)
Lubrication	Premix
Transmission oil capacity	1.48 qt. (700cc)
Electrical power	6V, 35W lighting coil
Primary transmission	Helical gear 2.60:1
Secondary transmission	⅝ x ⅜ Jwis chain 14/51 3.64:1
Gear ratios, overall	(1) 30.00 (2) 20.62 (3) 15.51 (4) 12.20 (5) 10.50 (6) 9.14 (7) 7.89
Wheelbase	57 in. (1448mm)
Seat height	35.5 in. (91cm)
Ground clearance	10.2 in. (26cm)
Curb weight	271 lbs. (123 kg)
Test weight	431 lbs. (196 kg)
Instruments	VDO speedometer with odometer resettable both ways by tenths.
Average fuel consumption	15–22 mpg

bikes are distributed in America by Rotary Cycles of U.S.A., a Cleveland-based firm with 140 dealers in the east and plans for a West Coast distributorship in the near future. Rotary sponsored several riders in ISDT Qualifiers and sent a three-man Manufacturer's Team to the Six Day in Austria where Billy Uhl on a 250 and Mike Rosso and Drew Smith on 175s all won Gold Medals. Rosso was the top American in the 175 class in the final day's motocross test, and Uhl was the seventh American overall in the Trial.

"A seven-speed transmission?" people query. There are conflicting stories as to why Sachs fitted so many ratios, especially since the engine is certainly strong enough to provide outstanding performance with only five speeds. Perhaps there are seven as a marketing gimmick, but it's more likely that real advantages were anticipated in advance. There are several: (1) First gear can be extremely low. Without touching the clutch the Hercules can easily cope with large rocks, natty uphills, logs across the trail—anything that would normally require careful clutch slipping. (2) Seventh gear can be an overdrive that results in a 90-mph-plus top speed for pavement sections of the ISDT, Baja dry lakes or just so you can stick it to your buddies in a speed contest. (3) The gears are close-ratio, so upshifting rarely bogs the engine. (4) Engine braking on downhills is more precise and flexible. (5) Since the transmission shifts beautifully 95 percent of the time, a rider can dial-in almost any kind of power with a flick of his boot. This is true because maximum torque—the gritty, dig-in kind of power—occurs at 6500 revs; and maximum horsepower—the neck-snapping wheelspin type—occurs at 8500 revs. Just shift up for the former and down for the latter. This tremendous flexibility is what makes the Hercules so versatile without being hard to ride.

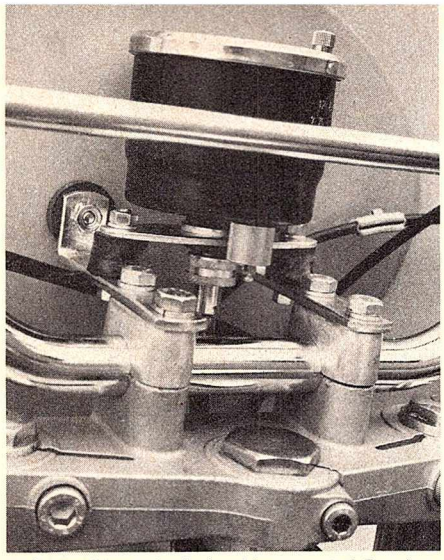
"Do the lights and speedo come with it?" Yes, and herein lies a major advantage over a Penton or Husky, which require $100 in parts and a day's installation to make enduro-ready. The Hercules' speedometer is a first-rate gear-driven VDO beautifully rubber-mounted on the triple clamp. The taillight includes a brake light, and the headlight has two beams. A horn is also standard, another contributor to the "enduro-legal" status of the Hercules, but Iowa corn grows louder than the horn honks.

The inevitable question: "How much does it cost?" Suggested Retail Price is $1698, over $100 less than a Penton, fairly close to the repriced Huskys and $250 more than a PE 250 Suzuki—but the Suzuki has about five less horsepower. Considering that the Hercules comes with lights and instruments, its price is substantially lower than its real competition.

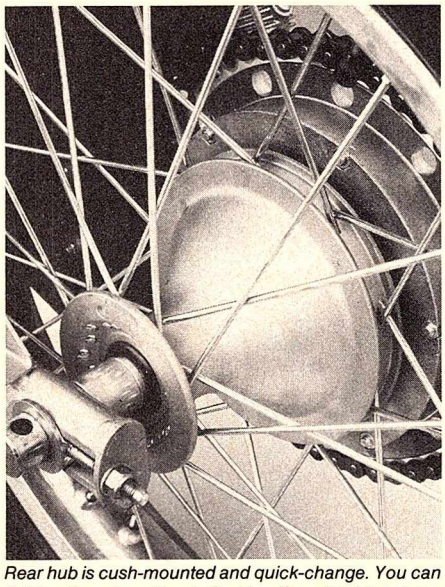
On Webco's dynamometer the engine easily spun off 28.26 horsepower at 8500 revs, the most of any true enduro *Cycle* has ever tested. The Hercules pulled Can-Am's latest ISDT 250 by 10 feet in a race to 90 mph, and it stayed with a CR 250 Husky in a violent dice up a high-speed fire road. The engine doesn't have the low-down gutsy enduro power of a Yamaha DT enduro or MR Honda, but it's not pipey like a motocrosser either. Below 5000 revs the motor holds its own and won't bog if the trail begins to rise, but there's no ready power for acceleration below the midrange. Beginning at 6500 revs, there is 23 hp or more for the next 2000 rpm, and this represents an extremely wide range of tremendous power. A good rider can work magic with the engine and an average rider will thrill to it. The Hercules climbed every hill we tried and beat or matched every 250 we raced.

There are no mystery ports in the 250's cylinder, as there were in the 175. A large main transfer is joined on both sides by a small boost port. The exhaust is bridged and features ears on the top half to in-

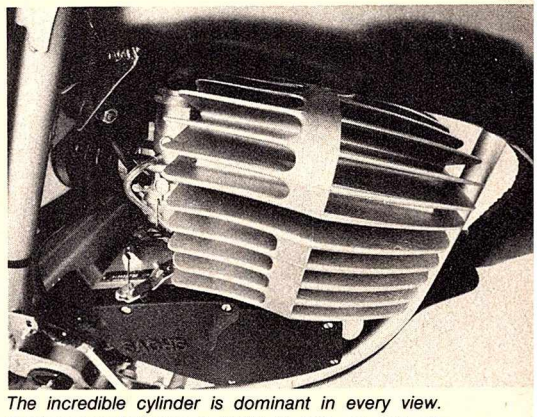
(Continued on page 117)



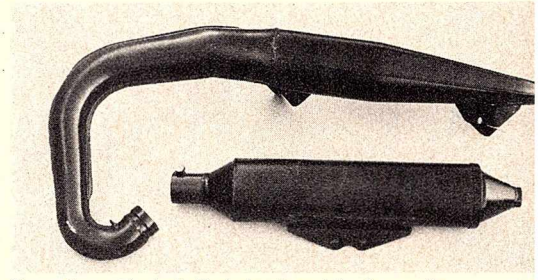
VDO speedometer is nicely rubber mounted. Four handle-bar bolts thread directly into the alloy triple clamp.



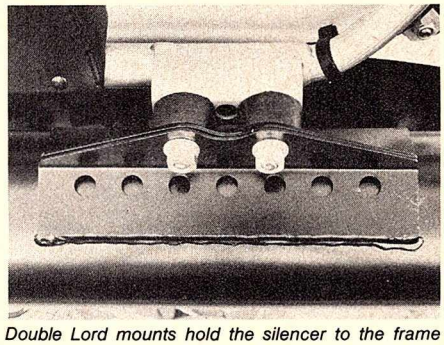
Rear hub is cush-mounted and quick-change. You can tighten the axle without pinching the wheel bearings.



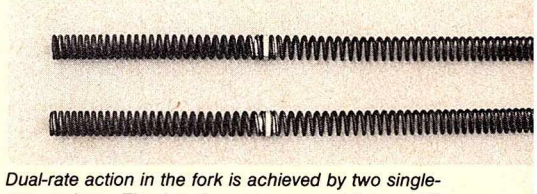
The incredible cylinder is dominant in every view. Rubber-mounted pipe is tricky to take on and off.



Huge silencer looks bulky but only weighs 2 pounds. Overall noise level of the 250 is still quite loud.

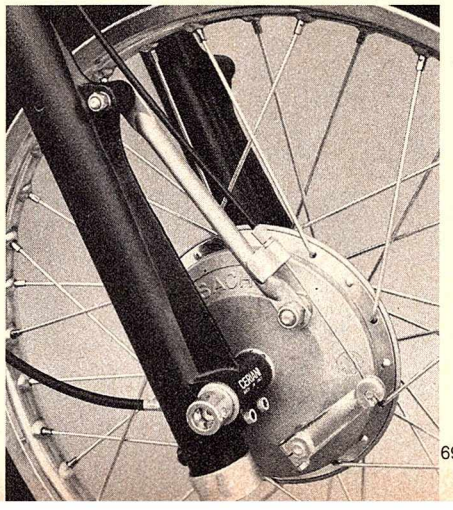


Double Lord mounts hold the silencer to the frame with 13mm nuts in an impressive mounting system.



Dual-rate action in the fork is achieved by two single-rate springs. The heavier ones are a bit too stiff.

Conical alloy hub has a steel-reinforced spoke flange and contains one of the best front brakes anywhere.

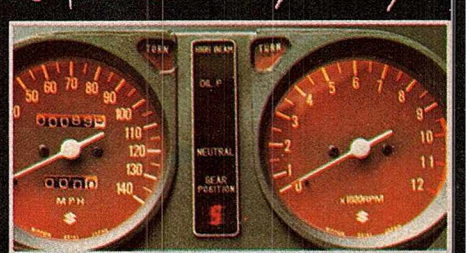


Suzuki's GS750 4-stroke four. "It is without question

If you're a 4-stroke man. A 750 4-stroke man who demands exceptional performance, handling, comfort, and reliability, there is only one bike in the world you want. Suzuki's GS750.

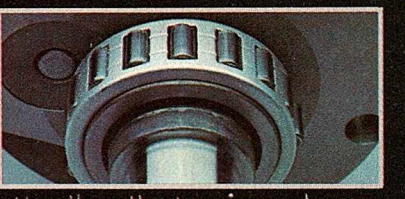
Don't take our word for it. Take Cycle's.

"Engine performance can only be described as perfect. Carburetion is perfect... on spot gearing makes the bike easy to use in any situation... The Suzuki engineers wanted the GS750 to be a good performer; they also wanted it to be comfortable over the long haul. It is, mostly because of the suspension." And when the need for real speed arises, be secure in the knowledge that the GS750 is fast. "No bike in its class has the red line engine speed set so high (9500 rpm). It is the fastest 750 you can buy." In addition, Suzuki's GS750 is quietly stylish, beautifully proportioned, unobtrusive, carefully built..."

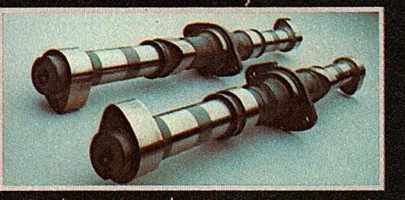


"Astro-lighted" instrument panel. Full instrumentation includes digital gear indicator.

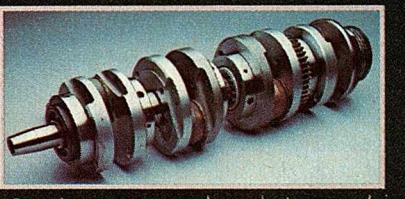
the best motorcycle in the 750 class." Cycle (Sept. '76)



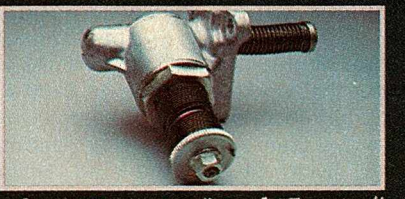
Needle roller bearings at race eliminate crankshaft friction; improves durability.



Dual overhead cams: Allows higher rpms. PLUS: specially hardened camshafts for added reliability.

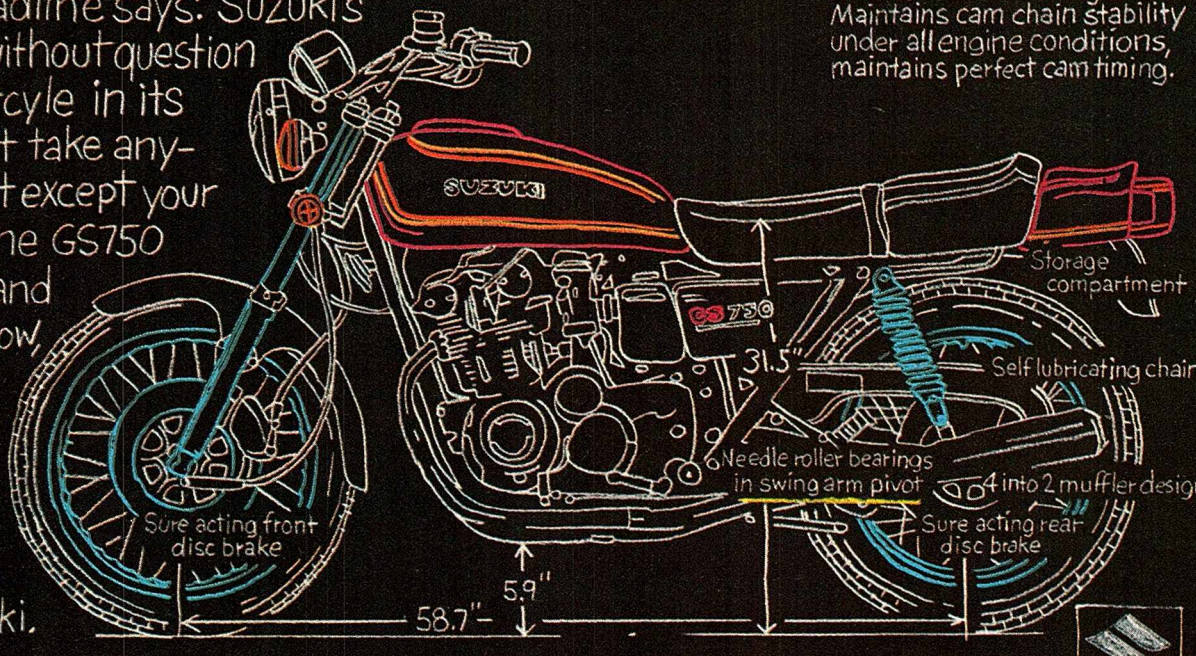


Due to exceptional crankshaft balancing, engine performance at all rpms gives smooth, vibrationless ride.



Suzuki Exclusive: "Posi-Tension" automatic cam chain adjuster. Maintains cam chain stability under all engine conditions, maintains perfect cam timing.

As the headline says: Suzuki's new GS750 is without question the best motorcyle in its class. But don't take anyone's word for it except your own. Go see the GS750 for yourself – and discover why now, more than ever before, you can forget your troubles when you get on Suzuki.



FORGET YOUR TROUBLES. GET ON SUZUKI

SUZUKI ©

CIRCLE NO. 72 ON READER SERVICE PAGE.

● ONE CALIFORNIA MOTORCYCLIST recently made an important contribution to science when he fell off, whacked his noggin on a guard rail post and came within a capillary's breadth of suffering serious brain injury. He couldn't have known a bunch of people were waiting for someone to do just what he did, wanting a closer fix on the impact level a helmeted head can take without having its contents scrambled. Our man didn't disappoint them: he bashed squarely against the flat side of the post hard enough to leave a tell-tale pattern of damage on his helmet; hard enough to knock his eyeballs thoroughly but not permanently ungimballed. His experience is important, because researchers will be able to impact identical helmets on an instrumented head-form until they get the same kind of damage, at which point their gauges will have told them how much whack was almost too hard for the gray matter in one human head to survive intact. And the numbers they get eventually will be reflected in the design of future helmets.

You might be thinking that our anonymous rider's helmet couldn't have been much good if his crash damaged it enough to create a record of the forces involved, yet did not do him lasting harm. But it is precisely because the helmet absorbed the impact and suffered the damage that its wearer still functions normally, as comes clear if you examine the situation closely. A human head of average size and density weighs about ten pounds, and if it gets thudded against an unyielding surface at only ten miles per hour that works out to be an 8800 foot-pounds/second chunk of energy, which is more than enough to send shards of skull flying all over the road. Helmets protect by absorbing impact energy, and the available evidence suggests that today's first-rate helmets can handle up to around 17,000 ft-lb/sec jolts.

Until just this past decade helmets weren't much good. Their shells might be made of anything from aluminum to pasteboard, and there commonly was nothing between the wearer's head and the shell but a bit of soft sponge rubber and a fabric sling, which meant that a few nanoseconds after the shell hit a post your head hit the inside of the shell—and almost as hard. Today's helmets also use a hard shell as their outer surface, but cover much more of the head and are more rigid.

Modern helmet shells are made almost exclusively of fiberglass or polycarbonate thermoplastics. The latter is made by squirting molten plastic into a mold cavity, which is an extremely inexpensive process. Unfortunately, the process also hides a few opportunities for catastrophic error. Good polycarbonate shells are *very* good but if a dab too much pigment is added when mixing the plastic, if there's too much moisture in tha air, if the material is contaminated, or if workers handle the shell roughly in removing it from the mold, then all bets are off. Polycarbonate shells also are sensitive to some chemicals used in paints and cleaners, and may be seriously weakened by the drilling of the small holes needed for installing extra face-shield snaps. These shells can be extraordinarily tough, especially in their resistance to penetration, if made to high standards of quality and not mistreated (i.e. painted or cleaned with the wrong stuff) by the purchaser.

Fiberglass shells are, in varying degree, more expensive than those of molded thermoplastic. Fiberglass can be blown into molds as chopped fiber and uncured resin, which is very cheap but susceptible to manufacturing error and acquires adequate strength only if made fairly thick. Rough-cut fiberglass mats can be soaked in resin and stuffed into molds to cure, with slightly better results. Fiberglass cloth is most commonly used, and the best strength/weight result is had by using light, close-woven cloth pieces laid by hand in multiple, overlapping layers; fewer layers and coarser cloth are cheaper but not as good. Again, though not to the extreme of the polycarbonates, quality-control has much to do with the performance of a fiberglass helmet shell. If yours has a thin spot in it, and that's where you happen to come down, knowing its *average* thickness was adequate won't be a whole lot of comfort.

Fiberglass was around some time before helmets got to be good, as was the now familiar three-quarter-bubble shell configuration. The big difference, the reason for the vastly-improved protection provided by today's helmets, is found in the material used in the space between the shell and your head. This material is a stiffish plastic foam, either polystyrene or polyurethane, and it absorbs impact energy by crushing. Five years ago many helmets had crushable liners only a half-inch thick, and these were molded of a very dense, stiff foam because liners that thin had to be stiff to provide enough resistance to bottoming. Now, manufacturers use inch-thick liners of a somewhat softer plastic foam and these give markedly better protection than those of the recent past. Indeed, the improvement is so great that if your present helmet is more than two years old and fitted with one of the old liners, you should throw it away and get a new one. Replacement is expensive, but you should think of it as a matter of "your money or your life."

Helmets aren't much good unless they are on your head, which is why manufacturers are required to provide them with chin straps and fasteners strong enough to take a 300-pound pull. Nobody has discovered a way to convince everyone they should fasten their chin strap; we've seen plenty of people riding along with the strap's loose ends flapping in the breeze. Neither has anyone been able to convince all motorcyclists that the wearing of helmets is a life-saver—and we're not going to try. Anyone who rides without a helmet is a mental midget, without much brain to protect, and we're not going to worry about him. We do worry about the anti-helmet lobby's propaganda about how this indespensible safety item is supposed to obstruct vision and hearing and cause broken necks. It isn't so.

The helmet's innermost layer of padding is what makes it comfortable, which is important because people won't wear something that gives them a headache. Helmets' inner padding could be arranged to protect one's hearing, but that isn't being done just yet. Wind-noise at 60 mph is a bit over 100 decibels, high enough to cause a hearing loss after prolonged exposure. On the other hand, the wind rushing past your bare ear is even noisier.

No discussion of helmets is complete unless it mentions the Department of Transportation's attempts to highway-fund blackmail the states into making motorcyclists wear helmets under penalty of law. Government's actions in this matter have infuriated even those who are convinced that wearing helmets makes the best kind of sense. You should be more furious knowing that the DOT's tender concern for our well-being did not translate into a federal standard for helmet performance until 1974—eight years after all the noise about mandatory helmet laws began. And even now the standard is incomplete, due to bureaucratic dithering. The new federal standard covers only helmets in the "medium" size category; those smaller or larger have been ignored.

You'll find the interiors of many new helmets plastered with stickers, and these can be a useful indication of quality. The DOT sticker can only be used on medium-size helmets, by law, even if a manufacturer's smalls and larges perform at the level specified in the DOT's FMVSS 218 standard. A Snell Foundation sticker is an indicator of high performance, and some racing organizations recognize nothing else. Also on the list of acronymic sticker-names is the AAMVA, (American Association of Motor Vehicle Administrators) which has persuaded most states to adopt an updated ANSI Z90.1 standard for the smaller and larger helmets ignored in the DOT's paperwork. And, oddly enough, the helmet industry's own association, the Safety Helmet Council of American, is doing a worthwhile job: the SHCA program for members requires that they adopt and maintain strict quality-control standards, keep careful records, and submit to regular inspections. Backsliders don't get to use the SHCA sticker.

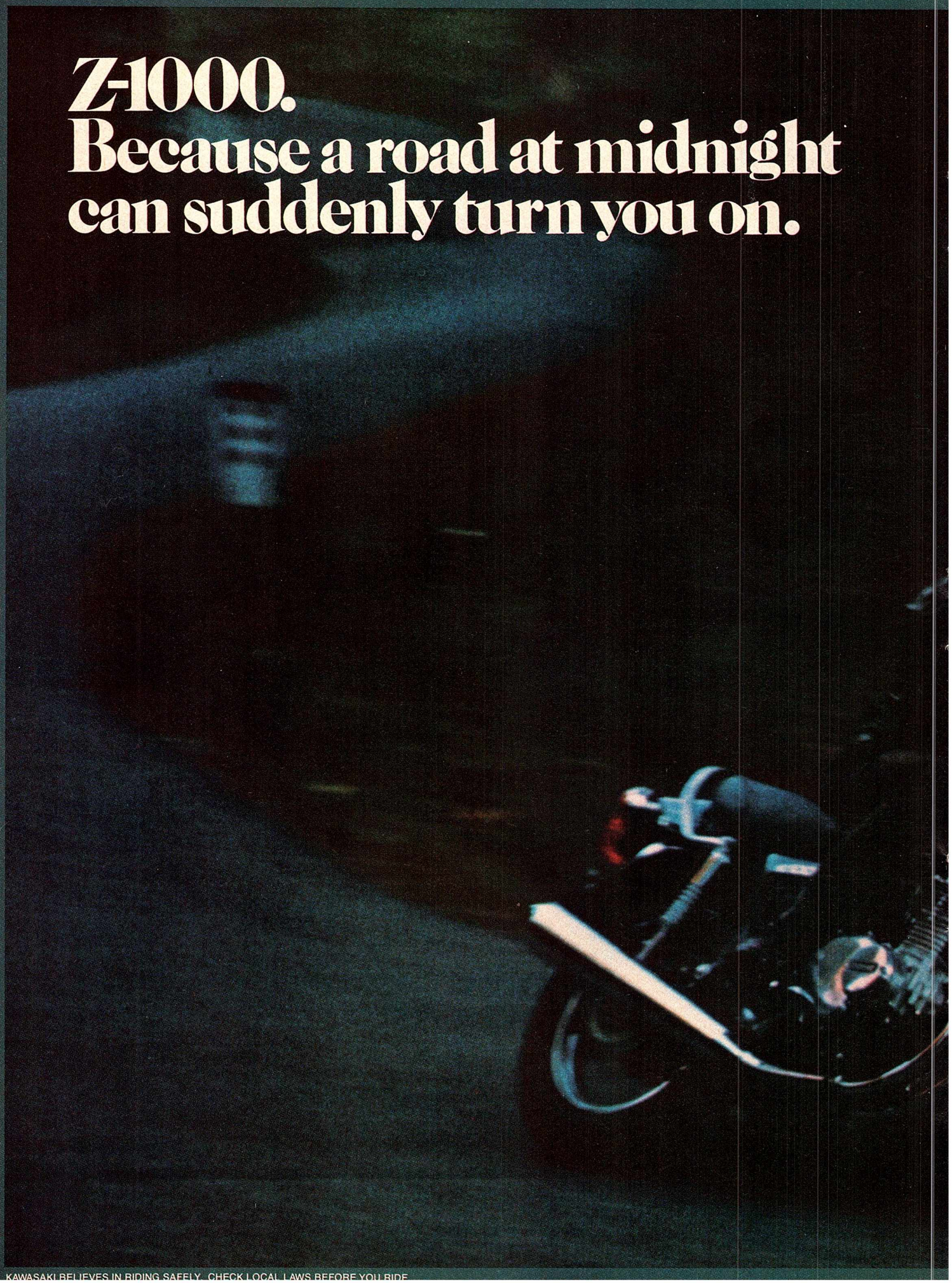
The most important thing to know, and remember, about how helmets work is that they don't work at all unless you've got one on your head. You say helmets aren't stylish? Believe us, you wouldn't want to be caught dead not wearing one. ◉

HOW THINGS WORK: HELMETS

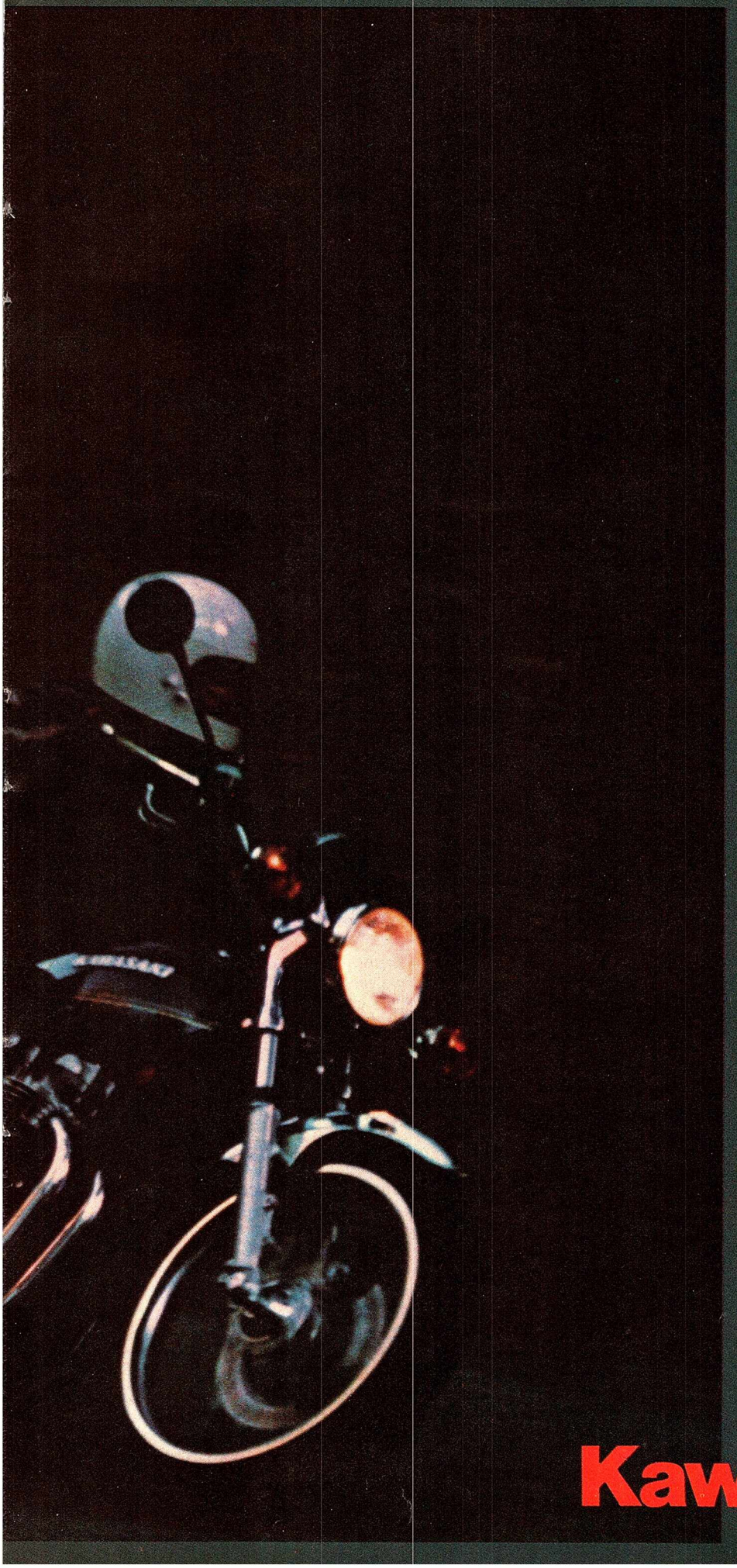
Nobody wants to think about crashing, but it happens to most of us sooner or later, and that's when a helmet can be the difference between life and death.

by Gordon Jennings

ILLUSTRATION: SHUSEI NAGAOKA



KAWASAKI BELIEVES IN RIDING SAFELY. CHECK LOCAL LAWS BEFORE YOU RIDE.



Things have a way of jumping out at you on a lonely road after dark—like the tight curve that looms in your headlight when you least expect it. That's when you discover that you and your bike both have quicker reaction times than you ever thought possible. Especially if your bike is a Kawasaki Z-1000.

This year, the bore of its smooth, dependable DOHC 4-stroke has been increased to 1,015 cc's, raising the horsepower to 83 at 8000 rpm, and improving performance throughout the powerband. The suspension geometry is designed for quick yet forgiving handling characteristics, with a 59.3 inch wheelbase and plenty of rake and trail. The shift mechanism has a solid, positive feel and has you looking for excuses to use it; even though the Z would let you loaf around in fourth gear if you were so inclined. The disc brakes, front and rear, haul the Z down in a big hurry. In fact, the Kawasaki Z-1000 is just about the best excuse there is for taking a night course in creative riding.

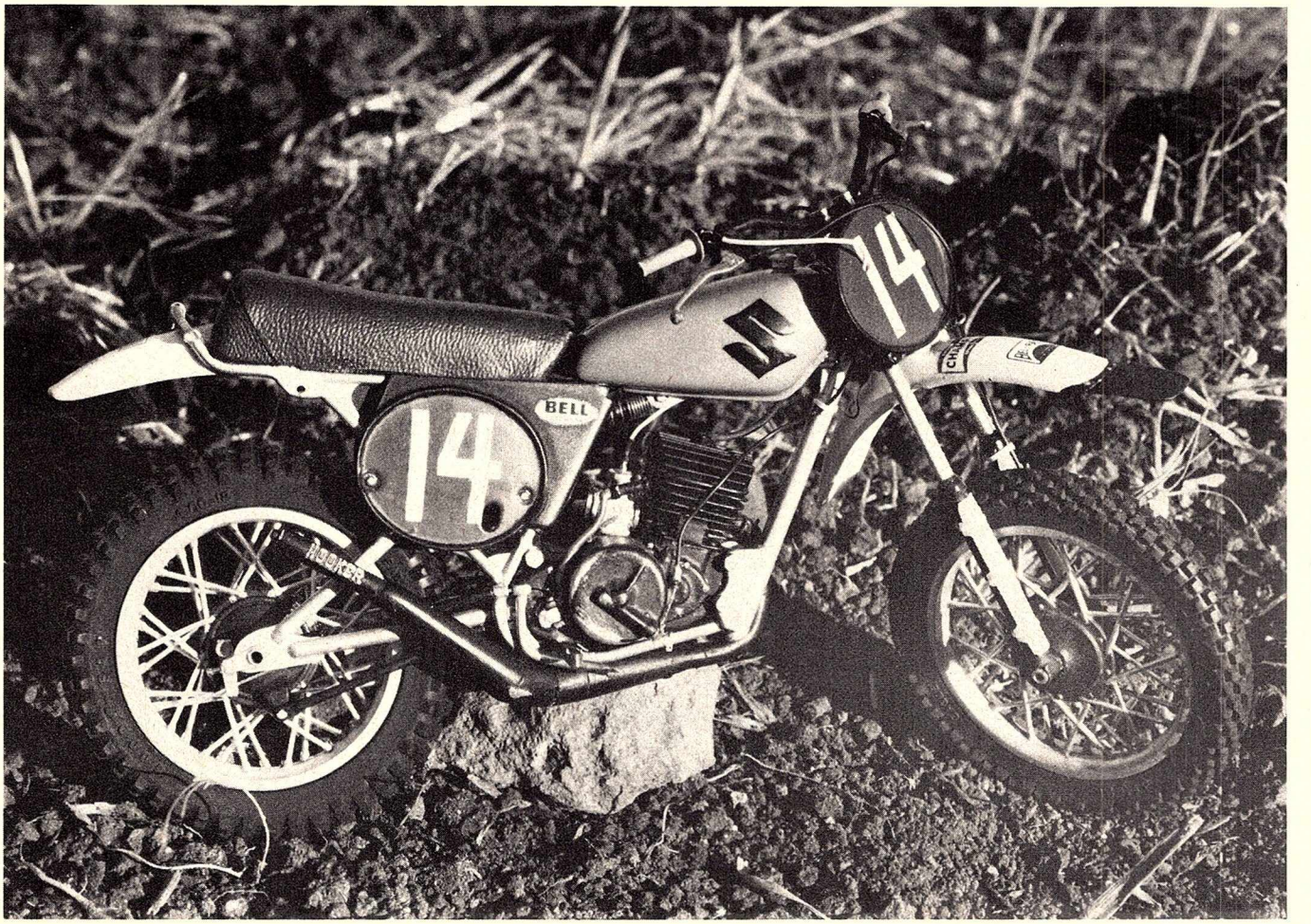
Kawasaki

We know why you ride.

CIRCLE NO. 27 ON READER SERVICE PAGE

WINNER!

The bike that won the Suzuki Model Contest does everything except make noise, burn gasoline and win motos.



● *Cycle's* Editors and representatives from Revell had been rummaging for more than a day through boxes containing Suzuki models. U.S. Suzuki had sponsored a model-building contest; *Cycle* had been called upon to participate in the judging. When we saw the heavily-modified TM400 Monoshocker entered by 16-year-old John Albert Harvey we suspected we had a winner. At the conclusion of the second day of judging we knew it.

John's orange-tanked TM was of course meticulously constructed; many models were. What made it distinctive was the imagination and ingenuity it reflected. The model has a working front fork (the springs came from a Cox small-airplane model engine); a scratch-built (from sheet stock) head and cylinder; a working rear brake cable, brake lever and brake arm; a working, spring-loaded kickstart lever; a working rear Monoshock, fabricated from plastic pieces rescued from the "tree" to which the model's parts were originally attached in the box, brass tube stock and a ball point pen spring; a spring-mounted and scratch-built exhaust system; axles made from hollow aluminum tubing; a handlebar made from 1/16-in. brass tubing; chain adjusters fabricated from pins and then filed down to resemble bolts; fuel line hose clamps made out of transistor radio antenna wire; and hand-built footpegs, air boot clamps, brake arms and brake stays, the aluminum and tin for which came from Coke cans. To manufacture the hand-control levers he wanted, John heated the kit-levers, reformed them to resemble Maguras, used these reformed pieces to make patterns, and then cast his own levers in lead.

PHOTOGRAPHY: PAUL R. HALESWORTH

Altogether John's contest-winner has 56 scratch-built components—including the spark plug cap. It took him 200 hours to build, and countless days rummaging through auto parts stores, hobby shops, paint shops, fabric shops and his father's collection of old model railroad parts. The TM400 is John's first model motorcycle. He has been into modelling for six years, mostly devoting his talent to ships and airplanes.

What did he win? A custom-built Datsun pickup truck prepared by Creative Car Craft in Hawthorne, Cal. and a brand-new Suzuki RM-125 motocrosser. Our congratulations to him—and to his father, who taught him all about model-building. ◉

THE YAMAHA XS750.

The sophisticated touring machine built for those who demand excellence.

CIRCLE NO. 32 ON READER SERVICE PAGE.

The Yamaha XS750:

A new kind of big motorcycle.

The new Yamaha XS750. It's not just another large motorcycle that's too big, nor is it just a fast, one-dimensional speed machine.

Rather, the new Yamaha XS750 is one of the very few large motorcycles currently available that's been engineered and designed, from the frame up, for the experienced enthusiast who demands a well-powered, incredibly smooth operating machine for touring, commuting, and the pure pleasure of riding.

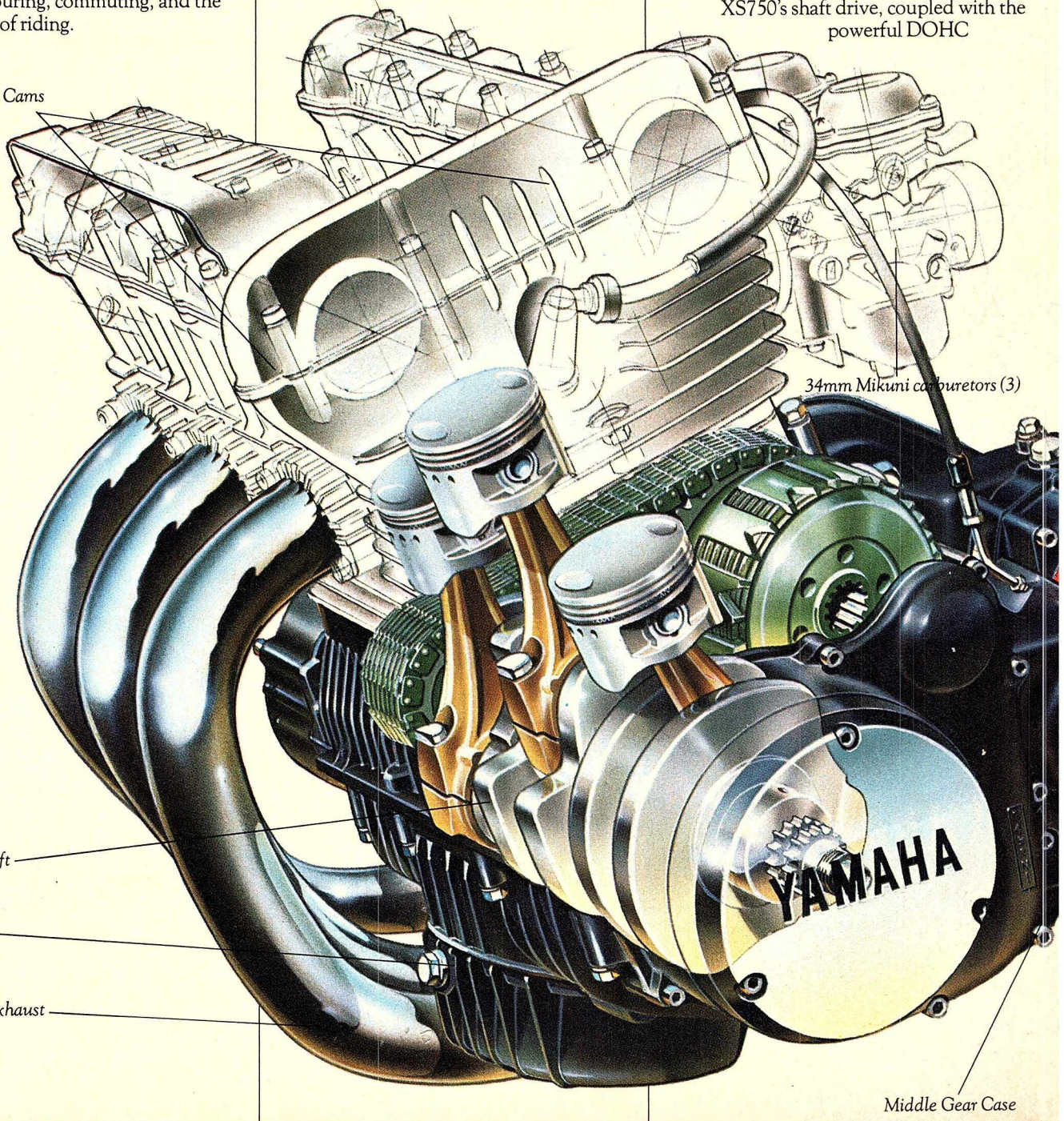
The DOHC four-stroke triple.

The XS750's engine is the first element of this machine's uniqueness. It's a dual overhead cam three cylinder four-stroke engine. This transversely-mounted triple displaces 747 cubic centimeters with a 68mm bore and a 68.6mm stroke.

The long stroke provides a high degree of low end torque, for acceleration and cruising. Yet the engine revs easily and develops a remarkable amount of useable horsepower. And each of the cylinders is efficiently fed by its own 34mm constant velocity Mikuni carburetor. The engine runs with incredible smoothness because of the 120° crankshaft configuration (see illustration). And the crankcase is equipped with a Positive Crankcase Ventilation System to keep blow-by gases within the engine.

The shaft drive.

Certainly the shaft drive is the kind of feature which sets a motorcycle in a totally different class. And for good reason. The XS750's shaft drive, coupled with the powerful DOHC



An engineering masterpiece.

triple, makes this motorcycle's performance incredibly smooth. The shaft itself is fully enclosed so that no drive-line part is exposed, which makes the XS750's maintenance almost trouble free.

The drive-train's performance.

The performance of this transversely-mounted shaft drive DOHC triple is unlike most other motorcycles. The engine's evenly developed horsepower is transferred with minimum vibration directly to the rear wheel. The entire operation of powering the rear wheel is smoother than a chain, easier to maintain, and more mechanically precise. Since the crankshaft is transversely-mounted there is no torque reaction that's common to other shaft drive motorcycles. In essence, the new Yamaha XS750 offers the proven advantages of shaft drive without excess weight or bulk normally associated with this type of drive-train.

Suspension and brakes.

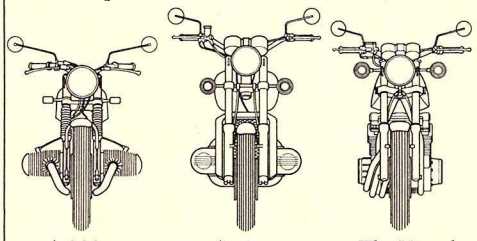
The XS750's chassis, designed for this shaft-driven triple, is a modified duplex cradle for extra rigidity. The rake and trail of the front fork are positioned for sureness and comfort on long distance touring. Likewise, the seating position and the seat have been designed and positioned for long distance comfort.

The XS750's braking is completely hydraulic disc, with a twin disc configuration on the front. And the front disc calipers are mounted behind the fork tubes, so they have little or no affect on steering. The rear disc is mounted opposite the shaft drive for balance.

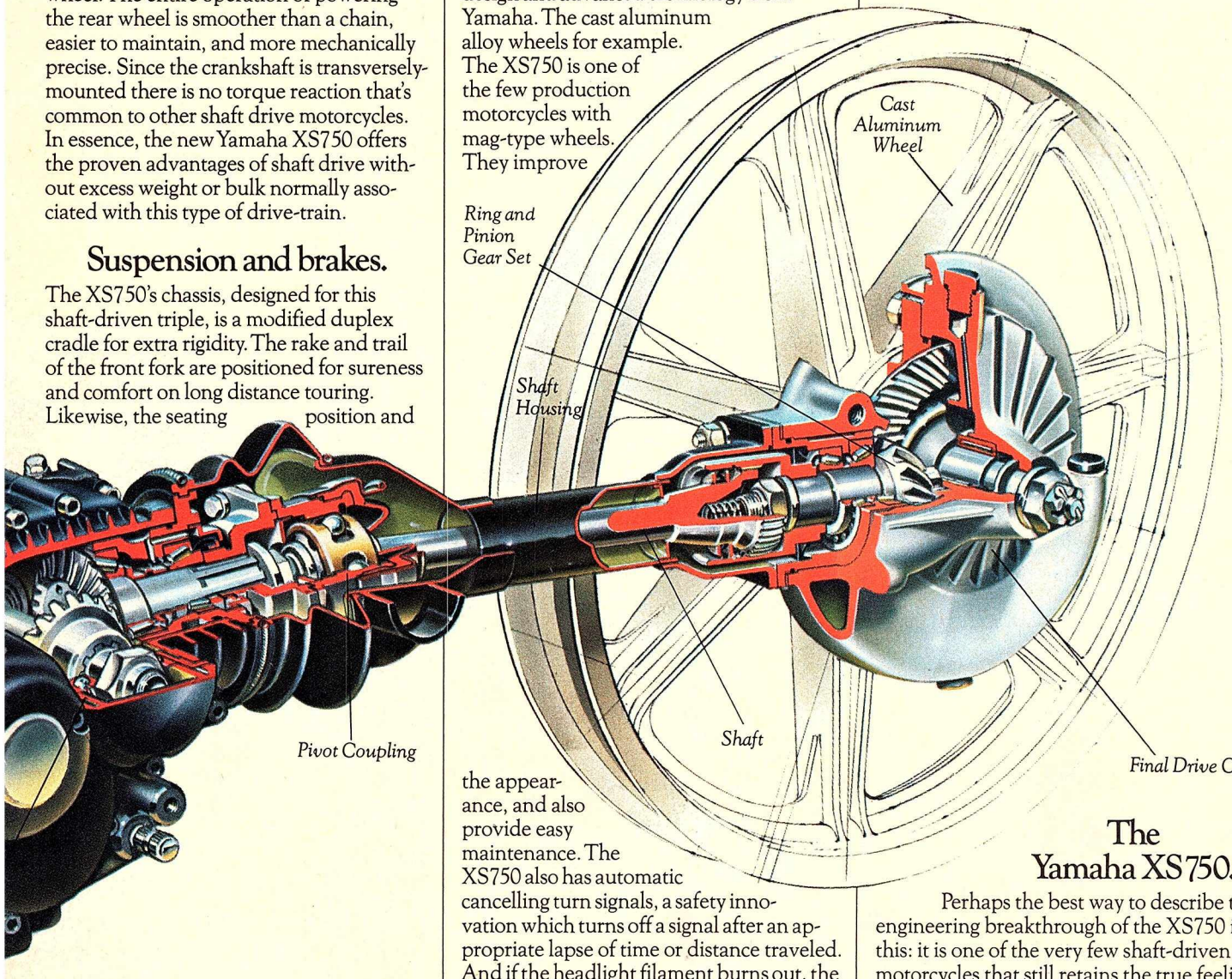
A thoroughly revolutionary machine.

The details of the XS750 are proof of expert design and advanced technology from Yamaha. The cast aluminum alloy wheels for example. The XS750 is one of the few production motorcycles with mag-type wheels. They improve the appearance, and also provide easy maintenance. The XS750 also has automatic cancelling turn signals, a safety innovation which turns off a signal after an appropriate lapse of time or distance traveled. And if the headlight filament burns out, the other filament will be activated automatically—another safety feature of the XS750.

Width:
If a motorcycle didn't have to lean into turns, width would not be an important consideration.



A 900 cc shaft-drive. *A 1000 cc shaft-drive.* *The Yamaha XS750.*



The Yamaha XS750.

Perhaps the best way to describe the engineering breakthrough of the XS750 is this: it is one of the very few shaft-driven motorcycles that still retains the true feeling of a motorcycle. The best way to experience the new XS750 is to ride one.

When you know how they're built, you'll buy a Yamaha.

CIRCLE NO. 32 ON READER SERVICE PAGE.

How the Windjammer® III stays far ahead of all other fairings.

My first three features discussed the functions and types of fairings, and the Windjammer III's many distinctive advantages—including an array of options that no one else can match.

The basic reason why my fairings set the standard from the start, is the same reason why the Windjammer stays far ahead:

I get the story firsthand.

My experiences coupled with ideas from riders all over the country keeps everyone at Vetter working on new ways to make your riding more enjoyable.

Each year I log about 30,000 miles on dozens of trips... in all kinds of weather, over all types of terrain, on a variety of bikes. At rallies or on the road, I'm testing, questioning, making notes.

In short, my "office" is a bike. Anything I tell you, any product changes, any options I add—all come from actual practice. I know what I'm talking about.

We learn a lot through mail, too, from Windjammer owners. A questionnaire with every fairing asks riders what they like or dislike about it, and to suggest new options, modifications, etc. We get thousands of responses.

Riders' ideas bring tangible results.

And we pay attention to what you tell us. Rider suggestions have led to options like...

Six choices of color striping. Pocket tonneaus. Adaptor ring for the BMW headlight. Cigarette lighter with universal socket.

Now, firsthand experience, and listening to riders has led to...

New 'Vibration-Isolated' Instrument Module.

It ends the problem of vibration-damaged accessory instruments, due to engine and road shock.

The Windjammer Instrument Module isolates sensitive gauges in a shock-mounted unit, right behind the windshield. And they're all up front, easy to see.

You can get your Module with a blank face, and install radio, tape deck or CB. Or buy it pre-punched, for your choice of four instruments. Including...

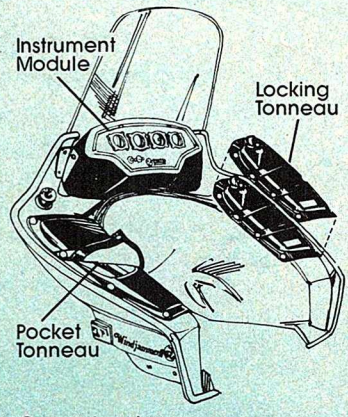
A new Vetter exclusive: VDO Jetcockpit® instruments.

VDO's top line. Proof once again of our policy to offer the best.

All VDO Jetcockpit® instruments feature anti-glare lenses, large digits and Day-Glo pointers.

As you'd expect, we worked out all details on wiring and adaptors. There's no cutting or soldering; and nothing extra to buy. Just plug the instruments into the Module circuit board, and hook up sending units to the engine.

And here's something else riders have asked for:



New locking tonneau.

Located on the right side, the locking tonneau beautifully matches the left-hand pocket tonneau; but it's rigid and, when locked, is virtually tamper-proof. The opening's been enlarged, so you can slip in cameras, etc. Furthermore, the locking tonneau can be retrofitted to any Windjammer.

For safe riding, use the convenient pocket tonneau for items like change and glasses. Keep the locking tonneau closed.

We're always listening.

Even as you read this, more features and options are in the works. Right now, in fact, we're changing Windjammer mounting nuts and bolts to the metric system, so you can use bike tools for installation.

In short, we never stop making improvements. And, you won't have to wait until "next season" or "next year" to learn about them. As soon as any change is perfected, it will be available through our dealer network... the largest in the business.

The Windjammer III: it starts out as the best—and goes on from there.

That's the way to do it right.

Vetter

The first to do it right.

Vetter Fairing Company
Rantoul, Illinois 61866
(217) 893-9300

Fourth in a series* by Craig Vetter

*For reprints of all features in this series, plus a brochure on fairings and the Windjammer III, write to us.

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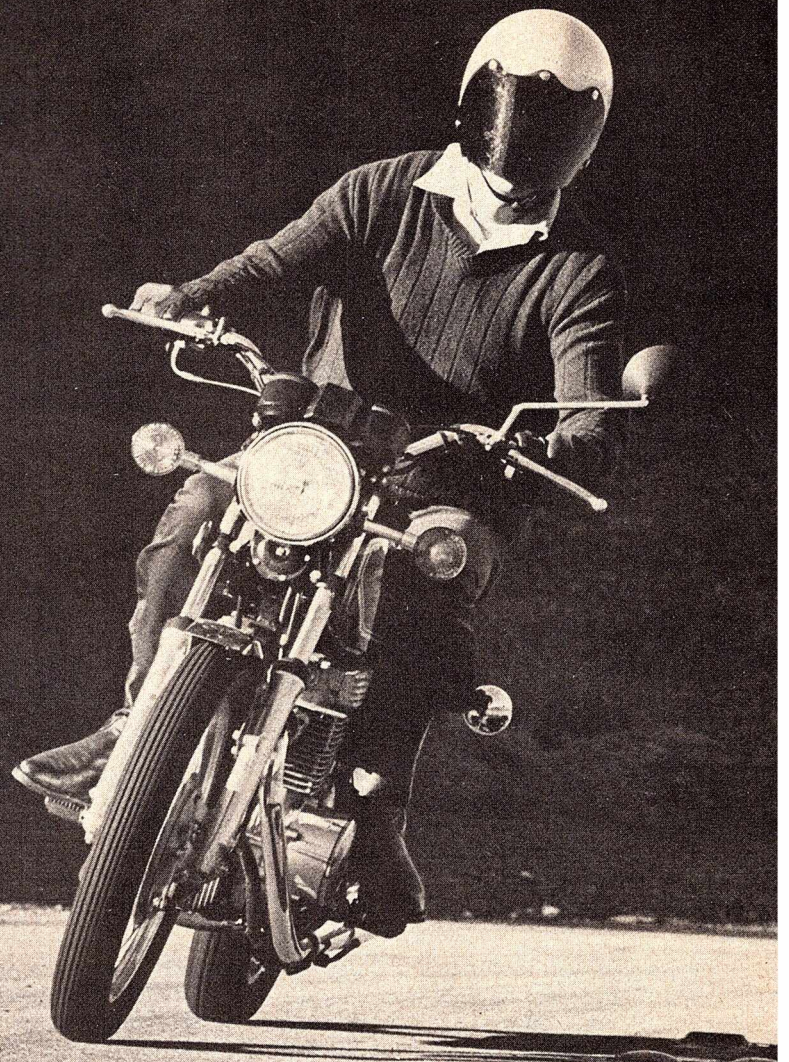
CIRCLE NO. 60 ON READER SERVICE PAGE

YAMAHA XS360-2D

The 2D is a standard XS360D in econo-trim. You pay less for the 2D—but still get a lot.

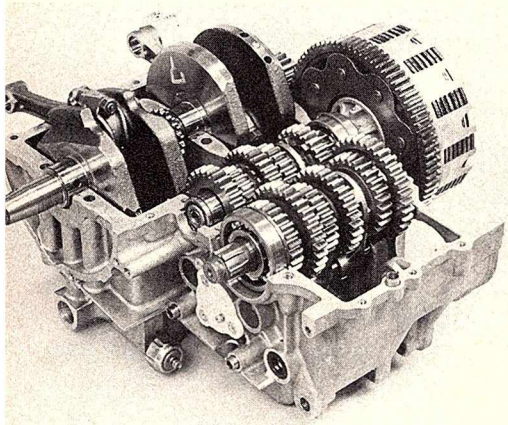


● TAKING A WORD FROM DETROIT'S LEXICON, you could call Yamaha's new XS360-2D a stripper. But this car-biz codeword doesn't quite apply to Japanese motorcycles like the XS360-2D. A Detroit stripper is a machine missing important parts; if you're lucky it still has back seats, ash trays and door handles. On the other hand, while the Japanese have made cuts, they've pared away with a certain restraint. In order to save potential customers $200 ($995 list versus $1197 for the standard XS360D), the "Special Value Edition" has no electric starter, uses a drum front brake instead of a disc, lacks a centerstand and has ordinary turn signals rather than Yamaha's impressive self-cancelling system. But that's it. Otherwise the motorcycle is exactly like the standard XS360D.

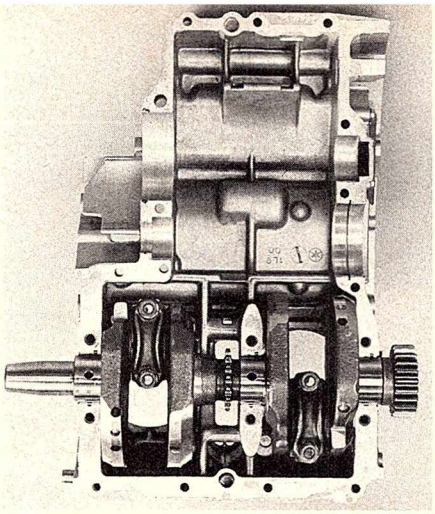
Yamaha isn't playing word games with their econo-360: you pay less and you get less, and there's no sense pretending that less is more. Less is less. But to their credit the Yamaha accountants and engineers have not changed or deleted any components that would turn the XS360-2D into a Detroit-style stripper. The comfortable saddle, the supple suspension, the willing single overhead cam engine and the six-speed gearbox all remain.

Compact mid-displacement four-stroke motorcycles (350–400ccs) have been sold by the tens-of-thousands for about a decade now, and this category traditionally has been the most sales-active part of the street-bike market. Honda got

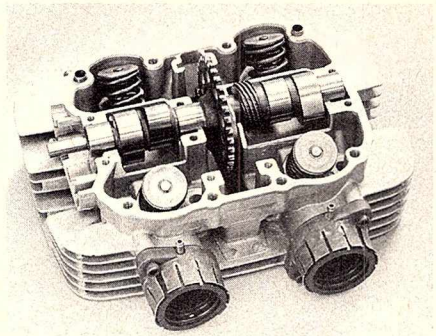
YAMAHA XS360-2D



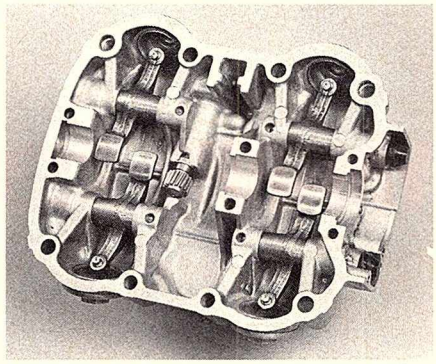
The very orthodox 360 engine splits horizontally, has six-speed gearbox, and no Omni-Phase balancers.



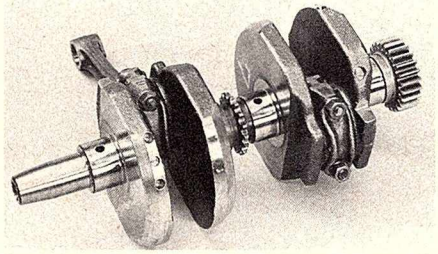
The one-piece crank is shown here in place in the top-half case. Primary drive take-off is on right.



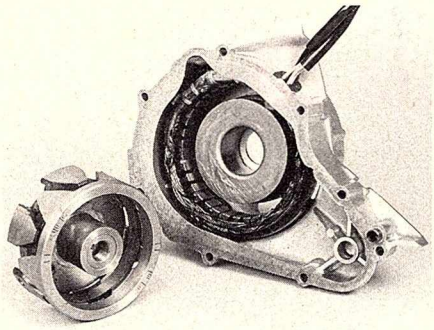
Camshaft runs on three plain bearings. Rubber carb manifolds have spring-steel support collars.



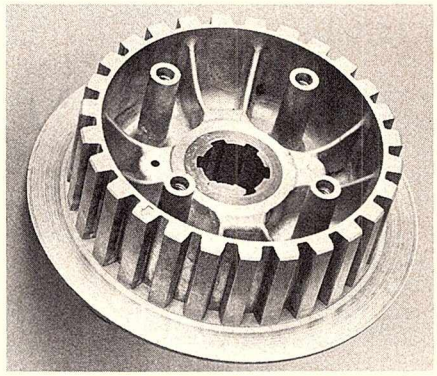
Rockers arms are contained in the cam cover. Tach gear is turned by screw gear on the camshaft.



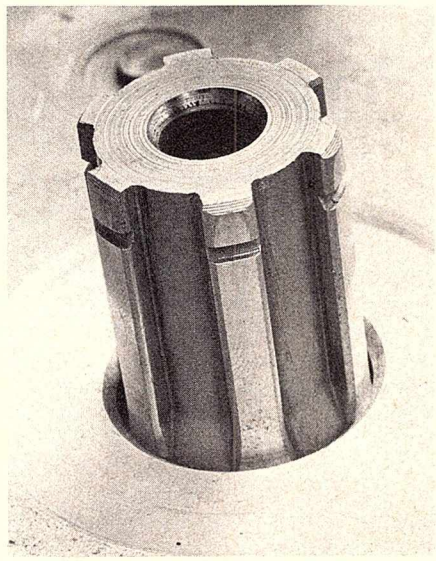
Crankshaft has two-piece rods on plain bearing big ends; crankpins are set at 180-degree intervals.



Standard-type alternator has inner and outer coils in left-side case; rotor spins on left end of crank.



Aluminum clutch hub has steel insert so that gearbox-shaft-splines mate to a similarly hard surface.



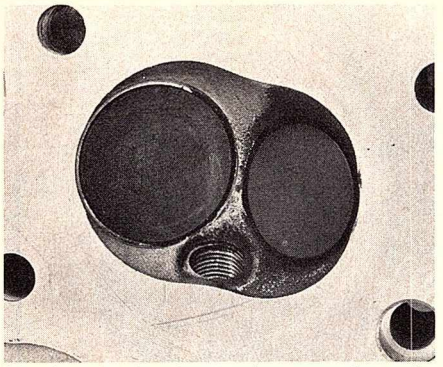
No nut secures the clutch to the transmission shaft. Instead a Seegar ring fits into this groove on shaft.

there first with the original CB-350, and later introduced its successor, the CB-360. Honda's early success encouraged other manufacturers to produce their own compact four-stroke twins, and the anticipation of air-pollution standards—which could be more easily met with four-strokes—likewise spurred Kawasaki, Yamaha and Suzuki into the present CB-360/KZ400/XS360/GS400 class. In this street category manufacturers can no longer ignore the hard facts of the marketplace. While it would be possible for any major maker to build an extravagantly engineered product, an $1800 motorcycle in this class would probably die in the showroom. For that kind of money, the floor traffic would move elsewhere—to a larger, more sophisticated machine. Price is an important consideration.

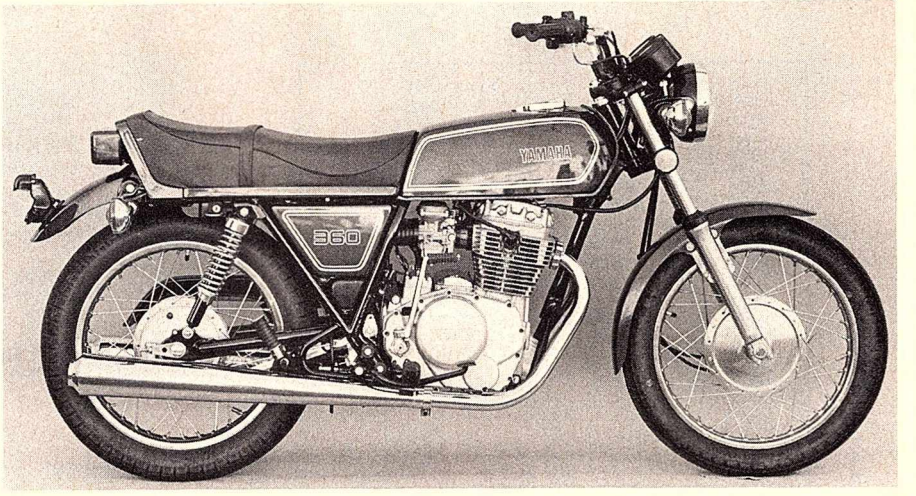
Motorcycles built on the twin-cylinder four-stroke pattern with displacements of 350 to 400ccs must deal with several basic and interrelated problems. Four-stroke vertical twins suffer the curse of inherent vibration. There's no way to perfectly balance the pistons, rods and crank assemblies dynamically. The more displacement a four-stroke vertical-twin has, the more severe the vibration problem will be, and the better an anti-vibration system looks. A manufacturer can add a system of counter-rotating weights, but this add-on engineering increases the complexity of the engine and the weight of the motorcycle. Using a different approach a maker can opt for a smaller engine (a 360 rather than a 400), hold down the weight of the reciprocating masses, set the crankpins at 180-degree intervals, (which produces less-objectionable rocking-couple vibrations rather than the great primary up-and-down shaking of 360-degree twins), and minimize the inherent vibrations as much as possible. Although Yamaha has done it both ways in the past, the company took the latter alternative in the 360 motorcycle series.

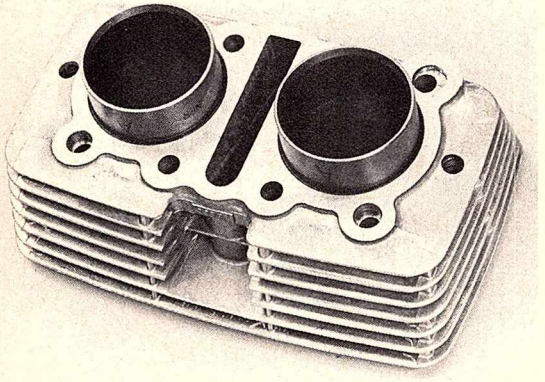
Weight and physical size are other areas in which careful trade-offs must be made when building a compact four-stroke twin. It's important to get the motorcycle scaled correctly to normal-sized Americans. Since 350cc engines are strong enough for serious street (and two-up) riding, the bikes must be big enough for Yankees to fit comfortably, even after a couple of hours and 100 miles on the road. Nevertheless, manufacturers dare not allow the motorcycles to become too large and heavy because obesity will ruin motorcycles that produce only 25 to 30 horsepower. The XS360-2D Yamaha scores well in the weight department. At 364 pounds, wet, it weighs about 15 pounds less than the standard XS360 and about 43 pounds less than Kawasaki's electric-start KZ400. With its modest power the XS360-2D is no dragstrip flash, though it turns the standing quarter-mile in 15.5 seconds with a trap speed of 82.6 mph. By comparison, a KZ400 runs the

PHOTOGRAPHY: ROBIN RIGGS

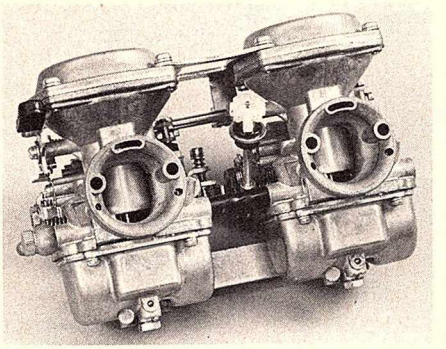


Closed combustion chamber does not arch over the whole piston top. Intake is 35mm; exhaust 30mm.

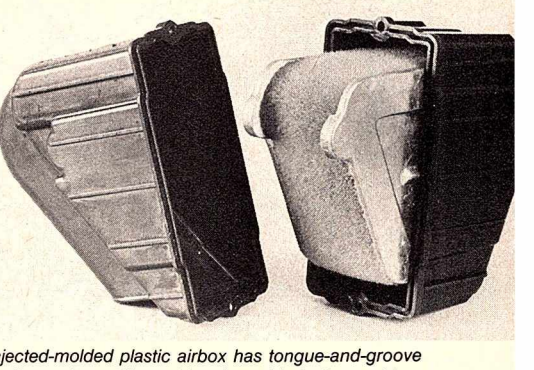




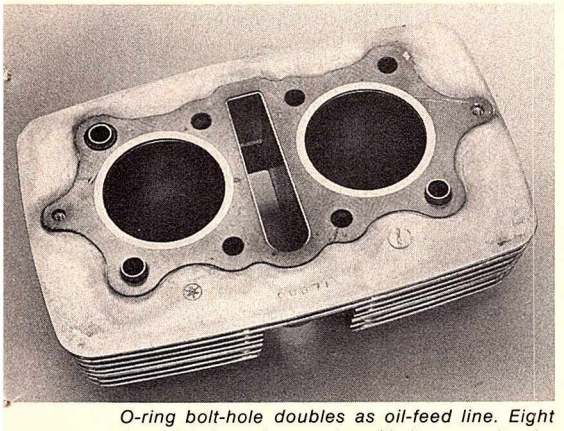
The one-piece cylinder block is held down by eight through-bolts; center cavity contains cam chain.



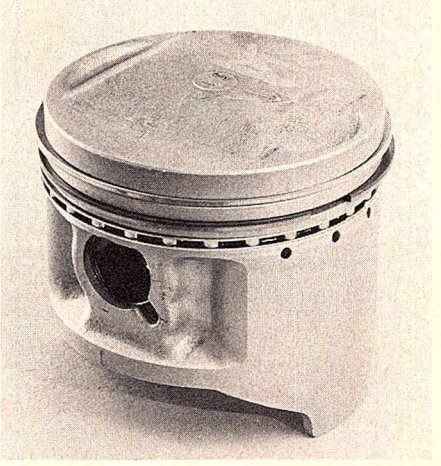
Slides in carbs rise as vacuum is created in chambers above the slides. Center knob is joint idle adjustment.



Injected-molded plastic airbox has tongue-and-groove mating surfaces. Element is a cleanable dry foam rubber.



O-ring bolt-hole doubles as oil-feed line. Eight through-bolts and two outboard bolts secure head.



Cast aluminum piston is almost flat-topped, but has a slightly-raised area. Arrow points to exhaust pocket.

quarter in 15.4 seconds, at 84.2 mph.

Yamaha is ahead of their competitors in getting street-bike suspensions to respond to irregularities in the road. Yamaha has overcome the static friction, or stiction, in their front forks by softening the fork springs and using super-slippery plastic inserts in the tops of the sliders. This combination increases the sensitivity of the front fork to small bumps and prevents tiny road jolts from being transmitted into the handlebars. The 360 fork has two-rate springs; the first four inches of travel are controlled by very soft 22.4 lbs/inch springs, and the final 1.5 inches of travel is handled by 26.5 lbs/inch springs. As for the rear suspensions, in general Yamaha uses softer springs and stronger damping than the current norm for Japanese rear shocks.

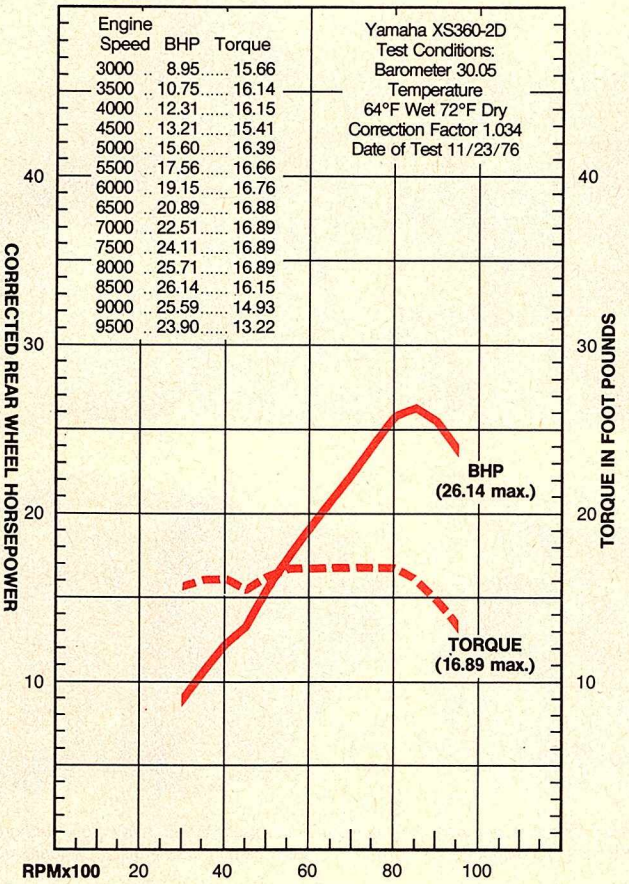
In the 360 series the revised Yamaha suspension system is an Especially Good Thing. Street motorcycles in the 350/400 category need all the help they can get to deliver on-the-road comfort. Foam-King saddles are just dandy, but squishy padding can't cure problems created by stiff-legged suspensions. On the freeway, bumps disappear into the Yamaha suspension components, making the XS360 the most comfortable motorcycle of the 360/400 four-stroke twins.

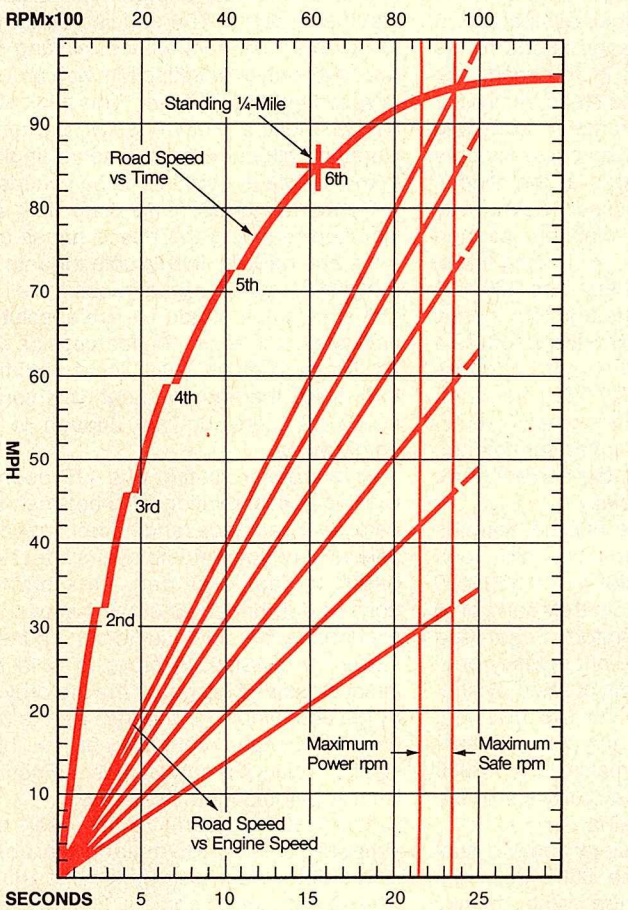
Yamaha has taken steps beyond suspension to insulate the 360 rider from discomfort. Although the rather blocky seat appears to have a distinctly unanatomical shape, experience indicates just the opposite. The padding conforms to human posteriors without sinking the rider five inches or letting him bob around in a spongy sea of foam. The thick seat also provides a pretty effective barrier to vibration, although there's some tingling in the saddle at certain engine speeds.

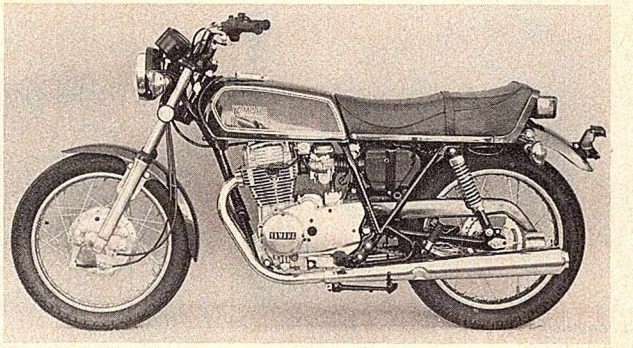
Rubber-mounted handlebars limit the vibration reaching the rider's hands and arms but, happily, the flexible mounts do not give the bars a vague, rubbery feeling. The soft-rubber handgrips are absolutely first-rate for comfort. The footpegs as well as the handlebars feed some vibration through to the rider—enough that you're aware it's there, but not enough to be bothersome.

Riders under six-feet and 175 pounds will find spatial relationships between the bars, seat and pegs ranging from acceptable to very good; riders over six-feet will begin to feel cramped. One staffer pointed out that anyone over six-two will experience the old kiddie-car squeeze inside 40 minutes. In order to hold the dimensions and weight of the motorcycle inside acceptable boundaries for the 360 engine, Yamaha couldn't get the bike sized to really big and tall riders. Football linemen should look elsewhere.

The steering geometry has been calibrated for round-town maneuverability and quick-response highway handling. The steering-head angle is 26.5 degrees; the trail measures 3.2 inches. You can







YAMAHA XS360-2D

Price, suggested retail	$995, POE West Coast
Tire, front	3.00S 18 Bridgestone Super Speed
rear	3.50S 18 Bridgestone Super Speed
Brake, front	7.9 in. x 1.38 in. (200mm x 35mm)
rear	7.1 x 1.18 in. (180mm x 30mm)
Brake swept area	60.5 sq. in. (390.23 sq. cm)
Specific brake loading	8.66 lbs/sq. in.
Engine type	Four-stroke SOHC Twin
Bore and stroke	66mm x 52.4mm (2.60 in. x 2.06 in.)
Piston displacement	358cc (21.9 cu. in.)
Compression ratio	8.7:1
Carburetion	2; 34mm Mikuni CV
Air filtration	Dry foam element
Ignition	Battery and coil
Bhp @ rpm	26.14 @ 8500
Torque @ rpm	16.89 @ 7000 & 8000
Rake/Trail	26.5°/3.19 in. (81mm)
Mph/1000 rpm, top gear	9.9 mph
Fuel capacity	2.9 gal. (11 liters)
Oil capacity	2.4 qts. (2.3 liters)
Battery	12V, 7AH
Primary transmission	3.25 (78/24); Gear
Secondary transmission	2.50 (40/16); ⅜ x ⅝ Chain
Gear ratios, overall	20.31; 14.44; 11.21; 9.14; 7.81; 7.04
Wheelbase	53.25 in. (1353mm)
Seat height	30.0 in. (762mm)
Ground clearance	5.0 in. (127mm)
Curb weight	364 lbs. (165.1kg)
Test weight	524 lbs. (237.7kg)
Instruments	Tachometer, Speedometer, Odometer, Tripmeter
Standing start ¼-mile	15.53 @ 82.56
Average fuel consumption	43.6 mpg
Speedometer error	Indicated 30 mph, actual 31.84 Indicated 60 mph, actual 60.04

The willing engine and compliant suspension are the best parts of the XS360-2D.

YAMAHA XS360-2D

thread a needle with the 360 at legal speeds, so long as you're precise and delicate with your inputs; at 75–80 mph the XS360 became too snappish and sensitive for at least a couple staff members. While the rear shocks had enough damping to suppress really hearty wobbling for lighter members of the staff, another staffer (200 pounds) found the damping insufficient. The bike would begin galloping after hitting small bumps in fast corners. The soft springs and a big payload cut the left-side ground clearance. Dialing up more preload on the rear shock springs helped the clearance problem, but then the fork springs felt too soft compared to the action of the preloaded rear springs. The XS360 was not intended as a back-road carving instrument.

Humming along at 60mph in sixth gear has the engine turning just about 6000rpm, a comfortable speed for the motorcycle. With six speeds the bike has a cog for any occasion, and the 360's very nice clutch has a broad engagement arc and light draw. The complete rev-range is available, right up to the 9300-rpm redline. Neither vibration nor mechanical reluctance discourage a rider from using the 6500–9300 rpm zone. On the contrary, the engine feels very willing; it thrives on revs though it never seems at all peaky.

The twin 34mm Mikuni constant vacuum carburetors will not permit an enthusiastic rider to momentarily overcarburete and bog the engine. The carbs have the 360 pulling cleanly and strongly from off-idle to redline. The only drawback to the CV carburetion is the rapidity with which the units shut down the engine when the throttle is rolled off. The soft front springs and the inevitable Japanese drive-train slop accentuate the roll-off effect in the 360's carburetion.

The engine, together with the compliant suspension, is the best part of the XS360. Simple and straightforward, the single overhead cam engine follows established Japanese practice, and shows a more restrained approach in street engine design than some earlier efforts from Yamaha. By comparison, Yamaha's 500 twin—with four-valves per cylinder and Omni-Phase balancing—seems radical, even though the 500 was designed and introduced years before the 360. But simple engines have a couple of important advantages: they're less expensive to build and a lot easier to service.

The XS360 engine is not without its interesting features. The 66mm bore (52.4mm stroke) committed Yamaha to a pretty expansive combustion chamber, at least potentially. In order to get the compression up to the desired 8.7:1 level, Yamaha could have used open combustion chambers with high-dome pistons. This approach might have necessitated complicated and expensive pistons, and/or made it difficult to achieve good flame propagation in the combustion process. Yamaha had a more direct solution, closing up the combustion chamber, by making—in very rough terms—two half-spherical pockets connected by an alley. Around the 35mm intake valve the chamber measures about 48mm across at the bottom of the cylinderhead, then necks

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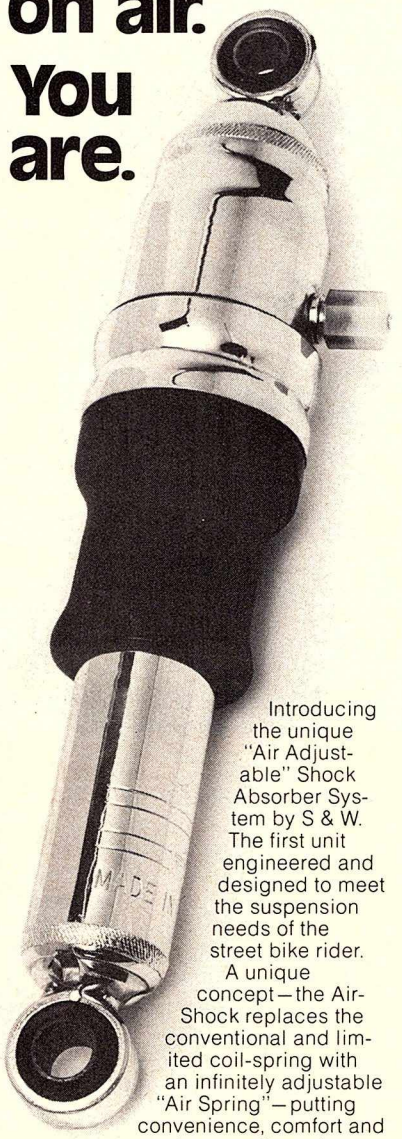

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86 CIRCLE NO. 31 ON READER SERVICE PAGE.

down to 46mm between the valves, and opens up again around the 30mm exhaust valve. The pistons have very slight domes which fit into the 23cc combustion chambers.

Yamaha's approach yields a very compact combustion chamber that's easy to manufacture. Of course the valves are shrouded, and the engine might breathe better with a different kind of combustion chamber, but that's of no great consequence. The XS360 isn't a racing engine; it only has to make a usable, reliable 25 horsepower, and that it can do within its rpm-limits.

In other places the engine follows convention. The rocker arms are carried in the camshaft cover; the camshaft, riding in plain bearings, is driven by a single-row cam chain that runs up a cavity between the cylinders; the contact-breaker ignition points mount off the left end of the camshaft; two-piece connecting rods have plain-bearing inserts in the big ends; the one piece crankshaft turns on three plain-bearing mains; a gear-primary runs off the right side of the engine, while the rotor for the alternator fits on the left side of the crankshaft.

The XS360 engine has its cam-chain tensioner in the cylinder head hidden under the camshaft cover. It's sandwiched between the intake valves and behind the cam-chain sprocket. A spring and plunger bear on a long spring-steel chain guide with a scuff-shoe, which keeps tension on the camchain. On the opposite side of the cam-chain cavity, there's another chain guide running from the cylinder head down to the block.

The electric starter in the XS360D is located behind the cylinder block in a depression in the main case, and the starter chain runs down to a sprocket located behind the alternator. Of course the electric starting apparatus is missing in the XS360-2D, but the cases are the same in both versions of the 360.

Kickstarting the Yamaha is either a first- or second-kick situation, or an endeavor of six or seven passes. In part, quick cold-starts (35–40 degrees F. California "winter" mornings) depended upon pushing down the cold-start carb-lever just far enough—but not too far. Furthermore, the kickstarter mechanism doesn't always engage near the top of the lever's arc, and a quarter-kick won't start the 360. So you should manipulate the lever and turn the engine over until the kickstarter engages at a point which will give you a full swipe. The starter ratio is not perfect; that is, even a full swing will only turn the crank two revolutions. Careful readers should note that Yamaha's showroom brochures contain an error, stating that the Special Value Edition has primary kicking that allows the rider to start the engine in any gear. In this regard the Owner's Manual contains the correct information—"This model cannot be started unless the transmission is in neutral."

You might suspect that the substitution of a 200mm twin-cam drum brake for the 360D's disc would have constituted an unwelcome change. True, it took a few miles to get used to a front drum brake's self-servo effect, especially after becoming accustomed to disc brakes which have a very linear relationship between hand pressure and braking force. Even repeated, hard applications failed to get the drum brake to fade, and it is powerful. The brake did, however, feel a little less sharp and crisp at the end of our test period than at the outset.

The centerstand was sorely missed. Without it chain adjustment becomes a nuisance; you must hunt around for an appropriate box to place under the bike in order to elevate the rear wheel. Trying to adjust the chain without a box makes the task a two-man operation. With neither a box nor a helper, you've got a good chance of cocking the rear end and getting the rear wheel out of alignment. Lubing the chain also becomes a hassle without a centerstand because you must apply lube to a section of chain, and then roll the bike forward and lube the next section of chain.

This centerstand-economy raised the same question again and again: couldn't Yamaha have saved the money elsewhere? For the centerstand we would have traded the sidestand, the tachometer and a warning light to be named later. Most XS360-2D owners would probably want full instrumentation (looks sporty) and the sidestand (easier to use than centerstand); the chain would simply be ignored or serviced by the dealer.

As a practical matter, before purchasing the XS360-2D the potential buyer should be certain that he can start the motorcycle without undue difficulty, and he should persuade himself that, among other things, he doesn't need an electric starter. Convinced of that, the dollar-wise shopper will conclude the most significant thing that's been stripped from the XS360 is $200. ◉

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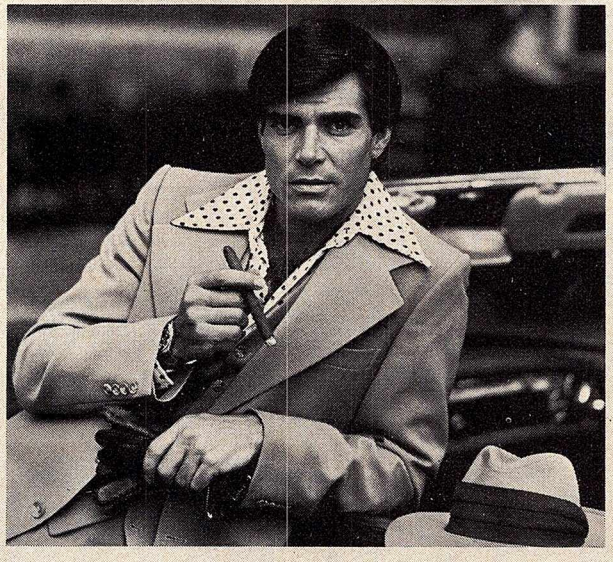

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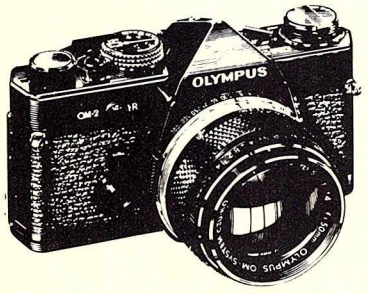

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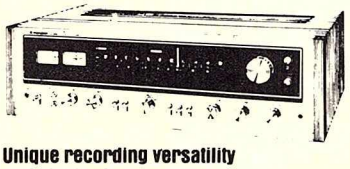

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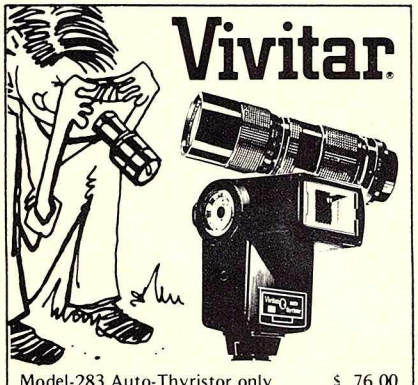

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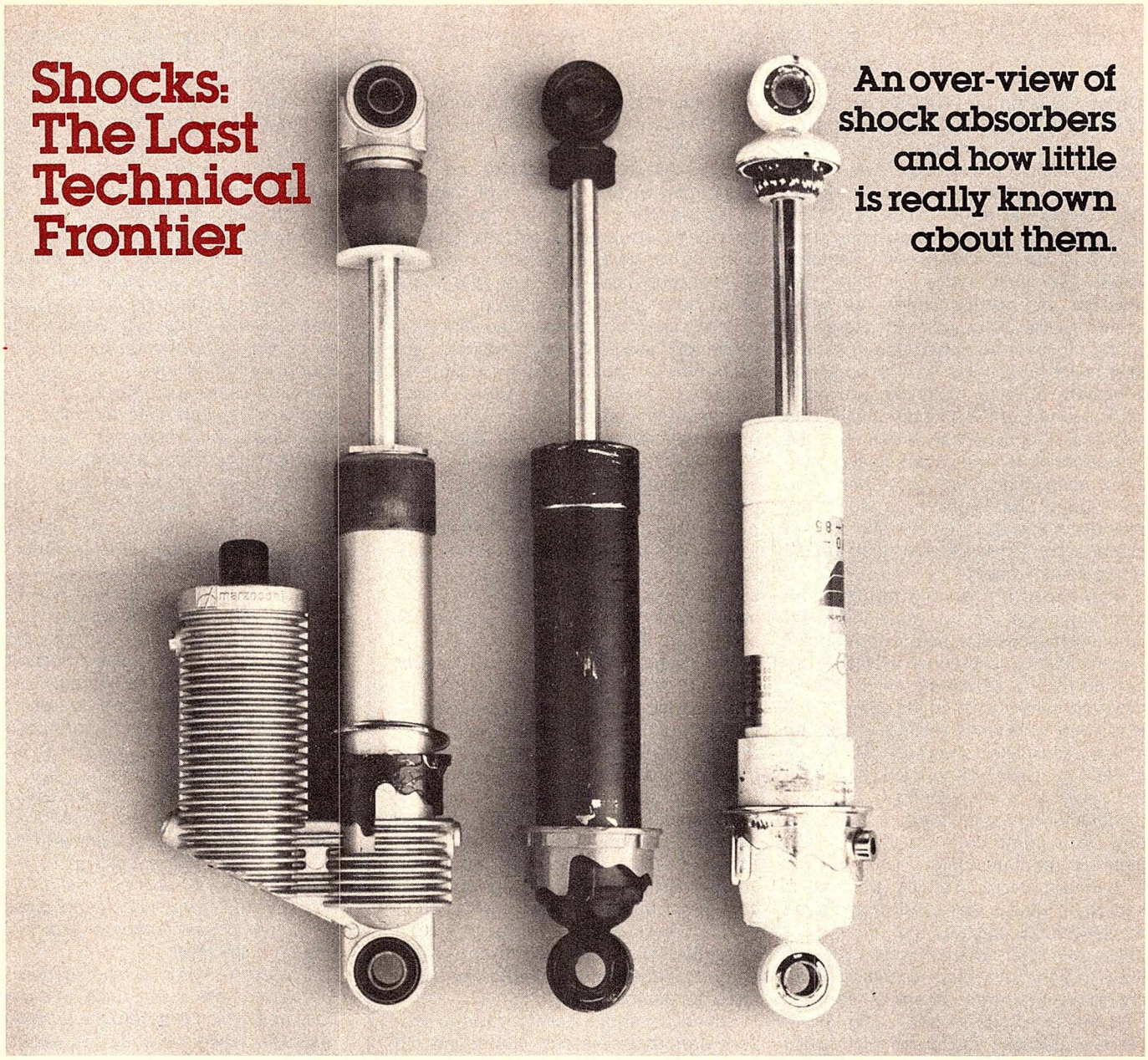
Shocks: The Last Technical Frontier

An over-view of shock absorbers and how little is really known about them.



By Dave Holeman

● EVERYONE HAS QUESTIONS about dirt bikes' rear suspensions but no-one has The Answer. There is no agreement even among experts as to which approach is the best. Rear shock absorber units and systems for dirt bikes develop problems that have stumped aerospace engineers, multi-million dollar factories, Grand Prix race champions, you and us. And when nobody has "the answer" the search for it is the most intense; that's just what people in the shock business are doing today.

There are more than twenty shock makers in the market, and numerous types of each brand. But there is no clearly superior production shock on the market. We have never heard of any professional expert who uses non-modified, over-the-counter production shocks. Each rider requires special spring and damping rates to match his riding style (and size), motorcycle weight, course demands and weather conditions. This is the case with the top motocrossers, cross country racers, ISDT riders and enduro kingpins.

The shocks that work best for Roger DeCoster will not match the requirements of Marty Smith or Dick Burleson or Carl Cranke or Larry Roeseler or Mitch Mayes. Similarly, the rear suspension that your friend raves about on his bike won't likely be right for you—even if both of you are the same size, have equal ability and are riding identical bikes. The shock manufacturers know that variations in shock absorber damper and spring requirements are virtually limitless. There is, therefore, no practical answer to the problem of making one, or just a few, shocks to meet the requirements of four million dirt riders.

Shock suppliers deal with the motorcycle suspension dilemma in three general fashions. A small percentage of manufacturers hand-build shock dampers and match springs to suit individual riders. This is the best and most costly method. Many more companies spend considerable amounts of time and money in development of shocks which will perform well for the majority of riders and can be mass-produced. These companies are equally serious about making quality products *and* bottom-line profits, so their shocks are generally middle-of-the road in pricing. And, as in any market in which demand exceeds supply, some individuals or concerns seek a fast buck. Fancy packaging, shiny finishes and foundationless claims are usually attached to temptingly low prices.

Our three-shock test is not a comparison shootout between the trio. It is three individual product evaluations which, over the span of three months of testing, finally jelled. The test bike was a 400cc Penton and the shocks were mounted at a 45° lay-down angle. The three shocks are

The Last Technical Frontier

available everywhere. They all use a gas/oil separation method where the damping fluid is sealed from atmosphere to eliminate aeration or foaming. Two of the shocks can be disassembled for servicing; one is permanently sealed. One shock features rider-adjustable gas pressure and has four alternative dampers valves and spring rates available. Gas pressure and valving cannot be rider-altered in the other two, but alternative spring rates are available. One manufacturer builds his shock in an alloy body with a cast-on auxiliary reservoir while the other two use conventional tubular steel cylinders. The Japanese shock uses the damper body for the piston sleeve while the American and European units two have slip-in piston sleeves. It would appear that these and the other shock manufacturers go to great lengths just to avoid similarities in design.

Manufacturing quality-control and damping fluids are the most important fabrication aspects of motorcycle shocks. The mechanical tolerances allowable are minute. With as many as a dozen hydraulic valving parts in the damper system, even very small tooling errors can multiply and make a shock useless. An old model-run shock will not always perform the same as a late-version because of manufacturing tooling wear. If used as a pair, you could end up with a mismatched set of dampers.

Hydraulic damping fluids are equally important. Little is really known about the damping fluids used by the shock manufacturers. We know of only two hydraulic fluids which have been specifically designed as motorcycle shock oil: Bel-Ray LT and a British-developed Castrol product available only in Europe. Hydraulics experts say the use of the lowest viscosity (thinnest) fluids are preferable to limit aeration. SAE 3- to 5-weight oils are most desirable. Thicker viscosity fluids (SAE 10- to 30-weight) will make vast and often undesirable changes in the damping action (compression and rebound) of a shock designed for thinner oil. Using a thicker oil will often require stronger springs to compensate for the increase in hydraulic restriction. A change in oil viscosity without a corresponding adjustment in spring tension will alter the speed at which the shock piston is able to move. This can cause pump-up (when the shock will not compress fully) or pump-down (when the shock will not rebound fully).

The upside-down mounting craze is, with few exceptions, not the smart way to fit shocks. It is true that sealed gas-pressurized shock dampers will function equally well in any position—right-side-up, upside-down or prone. But, the object of inverted mounting is to attach the lightest end of the shock to the swinging arm and thus reduce unsprung weight, and both ends of most shocks have about the same weight. Also, in shocks with a clearance volume bladder but otherwise conventional construction, leakage of gas out of the bladder into the fluid (which can happen) will cause a serious loss of damping if an inverted installation is used; the consequences of a leak are slight when the shock is right-side-up.

Fitting shocks properly is as important as factory assembly. More shocks are damaged or destroyed by careless mounting than assembly failure. When shocks are bolted to the frame and swing arm attachments you should check the side, top and bottom eye clearances. The shock eyes should slip between the support plates or bolt washers so that the rubber grommets cannot move freely side to side. This will lead to premature fatigue of the rubbers. If the grommets are considerably wider than the damper eyes the shock can wiggle side-to-side excessively and fatigue the rubber.

The rubber grommets in the damper eyes are themselves shock cushions. Without them compression and extension forces could shear the mounting bolts or damage the chassis. It is important that there be sufficient clearance in the top frame and bottom swing arm mounts for the damper eye to compress into the mounting channel the full distance of the rubber grommet's thickness. When the shock is fully compressed, the eye can become jammed like a pry-bar tip when the grommet is bottomed. The eye will get caught (with lay-down shocks) and, as the shock extends to a more vertical position, snap the damper shaft.

Lay-down shock configurations present new problems and compound old ones. The additional work load placed on lay-down shocks (versus those vertically mounted) demands more attention to the grommets and eyes. Many standard grommets receive more compression and shock forces than they were designed to accept, particularly if they are merely a carry-over from a conventional vertical or street bike design. When rubber grommets show the slightest form of fatigue it's time for replacement.

There also must be sufficient clearance for the spring, retaining cap and damper body to clear the frame and swing arm, as lay-down shocks pivot greatly from full-extension to full-compression. Some shocks cannot be mounted upside-down on certain bikes because the springs and retaining caps will bind on the swing arm or its supports when the suspension is compressed. If they bind, the retaining caps can break (releasing the spring), the mounting bolts can be sheared, holes elongated or the damper eye snapped off. Many experienced riders heliarc the eye

• *Nothing is new about the design concept of the Marzocchi large-body shocks. The Italian suspension firm has merely "beefed-up" their conventional small-body dampers without any change in fundamental design principles. To cope with the additional work loads placed on dampers and springs by lay-down shock systems Marzocchi increased the shaft, oil reservoir and spring wire sizes.*

The dual-reservoir design gives the Marzocchis the appearance of being heavy. They are actually light considering their size and complexity. Each complete shock weighs four-pounds, two-ounces, which is competitive with most other damper/spring assemblies. The body, shaft eye, preload cam, retaining screw-caps and sleeve retainer are aluminum. Only the chrome-plated shaft, piston, topping spring and sleeve are steel.

Marzocchi's low-pressure gas shock incorporates a patented, but uncomplicated, oil flow system. The compression (slight) and rebound (much heavier) damping orifices are separate. The piston damper valve assembly passes oil very freely on the compression stroke. On rebound the piston orifices are closed by a floating washer and the hydraulic damping fluid is then diverted to restricted holes in the piston valving, and past the rod to a chamber above the sleeve, where it drains into the outer shock body.

A conventional coil spring subdues topping jolts. The shaft seal is sandwiched between the body's screw cap and sleeve retainer. It is held in position by a soft spring. In its semi-isolated location it gets only a limited amount of internal pressure which will usually increase seal friction (drag) on the shaft.

To assure an oil circulation pattern, the foot valve in the sleeve rests on a cast-in base hole which runs into the auxiliary oil reservoir. When the body's screw cap is tightened a firm seal is formed by the pressure of the sleeve base plate over the hole. In this manner the Marzocchi draws all the damping oil entering the sleeve (on the rebound stroke) from the auxiliary reservoir rather than re-circulating fluid only within the main damper body.

The Marzocchi diaphragm-type pressurization system has two functions: to isolate the hydraulic fluid from air and to provide a compression chamber for the volume of the shaft during the compression stroke. It does not (measurably) raise the vaporization point of the oil. This shock is serviceable and can be disassembled easily. Optional damping valve systems are available but the main advantage of its disassembly feature is to permit replacement of the hydraulic fluid. The limited fluid capacity of shock dampers and their high-work load causes the oil to fatigue through shearing, and lose its viscosity very quickly.

The diaphragm bag is a neoprene cup

Marzocchi

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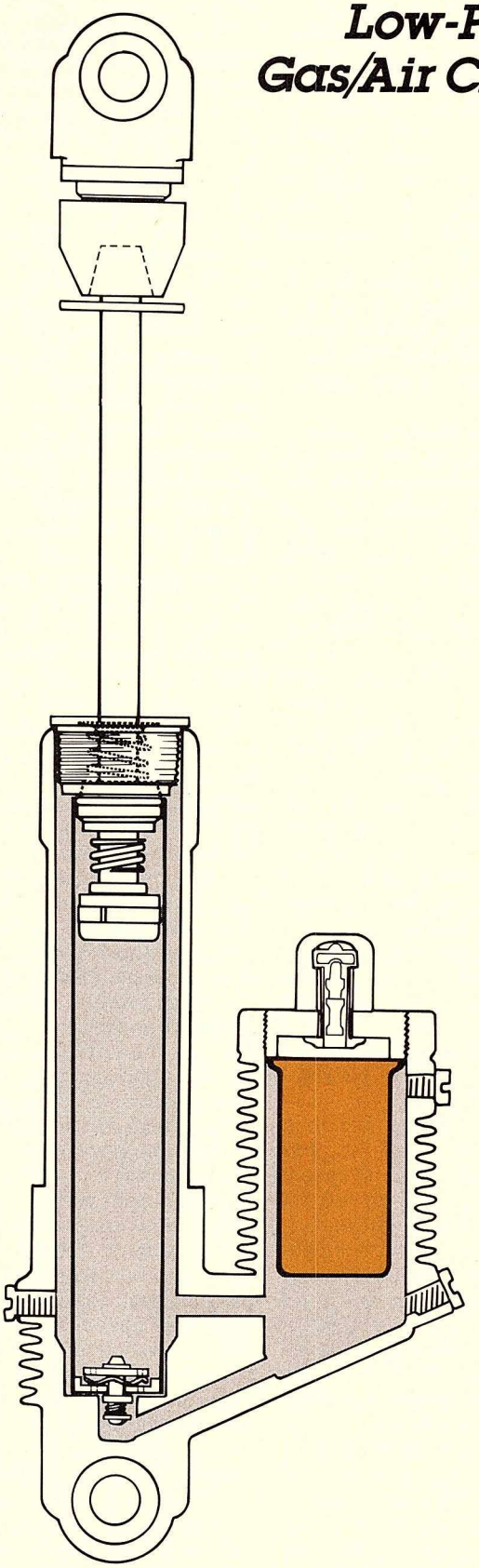


that fits in the auxiliary reservoir after the damper is filled with oil and pumped clean of air. A slotted screw in the auxiliary body permits air to escape from that chamber as the shock body is filled. The two phillips-head screws that seal the drilled oil passages need never be removed. The threaded cap over the diaphragm contains a conventional tire valve stem for charging. Operating air pressure is 28 psi.

The bulky design of the Marzocchi shock body will make it difficult to fit in an inverted position on some machines. We fitted our pair right-side-up. The Marzocchi is, when fitted, narrower than most damper/spring assemblies and will offer minimal interference with the chain. Our test units were the Number 4-series Marzocchis which have the strongest damping and highest spring (140 to 165 lbs-in.) rates. These are specifically aimed at the expert-level, big-bike riders. The Number 2 and 3 models have softer damping and spring ratings.

Bringing the Marzocchis up to normal operating temperatures requires hard riding over rough terrain. Otherwise the rigidity of the spring and damper will not allow sufficient shock movement to agitate and warm the damping fluid. At slow to moderate speeds the Number 4 units deliver a harsh ride.

The harder our Penton was ridden, the better the Marzocchis performed. They acted as if they preferred hard accelerating, fast riding through king-size whoop-de-doos. In a special eight mile-long whoop-laden section we use to find the limits of motorcycles' suspensions we were unable to make the Marzocchi dampers fade sufficiently to reduce comfort and stability. These dampers require continuous harsh usage to maintain normal operating temperature as they dissipate heat quickly.

At the conclusion of 80 miles of testing we disassembled the shocks for inspection and to replace the fluid. Disassembly and assembly are straightforward but require lint-free, hospital-clean conditions. The smallest piece of dirt or lint can foul the damping mechanisms. With Bel-Ray LT-100 (5 weight shock fluid) we noticed no difference in performance. The shock bodies never got really hot—just warm.

After another 80 to 100 miles we noticed that the spring preload had sagged markedly. The shocks acquired a slight pump-down problem as they hesitated to rebound quickly enough in continuous whoop-de-doos. Our Number 4 Marzocchis were far too harsh for trail and most enduro conditions. They would also be too stiff for any race bike smaller than 250cc. With a better-quality spring they would be the best over-the-counter shock assemblies available for experts—motocross, desert or enduro racers. As is, the damping units are the finest we have ever ridden.

The Last Technical Frontier

to the body and shaft for strength.

Large diameter shock/spring assemblies can pose problems with the chain hitting the damper or spring. The brake rod or cable can become bound or pulled by shock movement. The pivoting or swinging action of lay-down shocks requires lubrication of the eyes, bolts and any spacers that may be used. The shocks must be removed regularly, and the eyes cleaned and re-greased—especially in wet environments. Some shocks that use the shock body for the piston sleeve (rather than having a separate internal sleeve) can seize if the body is dented by a blow from a flying stone or even chain whip.

Rubber stoppers or bottoming bumpers for motorcycle shocks are, with rare exceptions, single-purpose items. They are commonly made of hard, high-density rubber, and are used to prevent the damper body from smashing against the eye mount on the shaft when the shocks are fully compressed. Most shocks are designed so that if the rubber bumper were removed, internal bottoming damage cannot occur. Others (externally adjustable types in particular) have a slim safety margin and the compression thickness of the bumper cannot be reduced. Experienced riders sometimes cut down the bumper's thickness to increase the amount of unrestricted shock and wheel travel. This is a risky business and can lead to early-on permanent damage.

Conventional hard-rubber bumpers have a production advantage—they are cheap—and a functional disadvantage—harsh damping reaction. Hard rubber bumpers absorb shock with minimal cushioning when hit quickly. Long, soft, porous-urethane bumpers eliminate the bottoming harshness, but cost substantially more to manufacture.

Springs must be matched to numerous variables—compression and rebound damping, wheel/shock travel and speed, chassis geometry, rider and bike weights and mechanical/physical tolerances. Additionally, they must be able to compensate for terrain, speed, and engine power.

Most shock dampers are designed around a specific spring. The spring's cam adjuster usually allows for ½ to ¾-inch preload adjustment in three to five equal increments. The change in pre-load does not measurably alter rebound force. The adjuster merely controls the amount of force (or weight) required to initially compress the shock. You cannot make a shock spring "stiffer" by jacking up the adjuster. You will only increase the force required to initiate wheel movement up from the full-extension.

Most dampers will tolerate adjustment of the pre-load cams without an effect on damping performance. This is because no real change in rebound force has occurred. However, replacement of the standard spring will effect the damper's performance. A shock damper that comes standard with a 100 pound-inch spring (pounds per inch of compression) can be overworked with a 120 pounder. At full compression, the rebound force jumps 80 pounds with a four inch travel shock. The work load on compression damping is reduced but the rebound force put upon hydraulic rebound restriction is beyond the damper's ability to control it. This type of mismatch increases the damper's work load, raises operating temperatures beyond design limits and will cause fatigue of the hydraulic fluids and/or mechanical parts.

Installation of a softer-than-recommended spring results in an altogether different set of problems. A soft spring will allow the shock's damping to over-power the lesser amount of rebound force.

Excessive rebound damping will cause the shock to "pack" or "pump-down." A too-soft spring cannot produce the rebound acceleration rate necessary to fully extend the damper under successive compression impacts. The shock (and wheel) will become trapped in a half-travel position between fuli compression and half stroke. In effect you will lose the first half of the wheel's (shocks') travel. Excessive bottoming will result in damage to the shock and fatigue of the spring.

Coil spring designs vary for three reasons—production costs, performance desired and available materials. Generally speaking, shock springs are a compromise in design. Making the proper selection is dependent on what spring rate (minimum and maximum) the damper can tolerate. The distributor or manufacturer should be able to give you these data.

Sophistication of long wheel travel damper units has limited the amount of compromise which has been designed-in. The old rule of thumb allowed for a 40 lb.-in. (twenty each side) spring tolerance. If a shock was designed for a 100-pound spring an 80 or 120 lbs.-in. change was acceptable. Today's more exacting damping designs and rates will accept, at best, a 20 pound (ten lb.-in. either side) variance without suffering over-springing or over-damping problems.

Spring design and construction is based on the practical limits at which wire can be wound economically. Ideally, progressive rate springs can deliver optimum performance by giving a soft ride on the bottom (to best soak up small undulations) and rise geometrically in load resistance as wheel travel and impact forces (large obstacles) increase.

Shock springs come in three basic designs—straight-wound, progressive and dual-rate. Straight-wound springs are of a

● *Red Wing shocks are produced by Kayaba, of Japan. They are very similar, if not identical, to the OEM Kayabas that come as standard equipment on numerous Japanese dirt bikes. Kayaba utilizes the de Carbon nitrogen gas pressurizing system, which offers numerous advantages. The sealed construction necessary with this high-pressure shock means the damper cannot be disassembled. This eliminates the possibility of an ill-experienced rider contaminating or incorrectly assembling the damper—a problem that plagues "rebuildable" units. The swedged / spot-welded / seam-rolled fabrication is necessary to prevent gas or oil leakage. The Kayabas are nitrogen pressurized to 15 atmospheres (220 psi) during assembly (with the dampers fully extended).*

This particular de Carbon system uses a floating piston to separate the hydraulic fluid from the gas. The floating steel piston has a 6mm-wide neprene O-ring as a seal. The gas chamber formed by the floating piston is slightly more than an inch high and the inside diameter of the damper body.

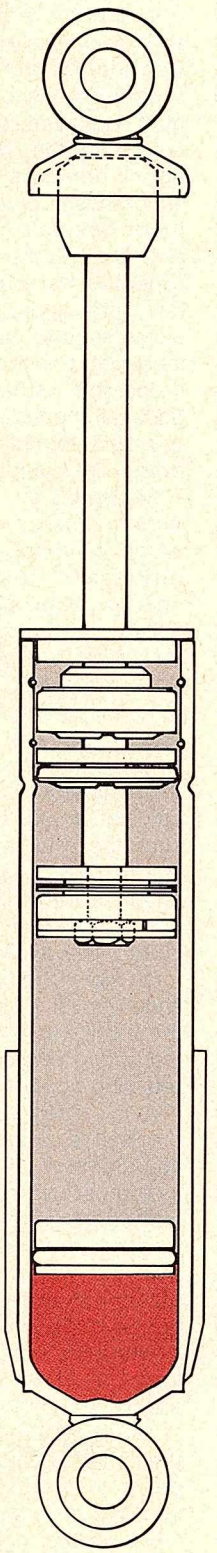
The oil reservoir takes up the next four inches of the damper body's length and contains a 3-weight hydraulic fluid. The final inch of the damper body contains fixed-in-place neoprene and steel valving rings. These rings work as a hydraulic topping spring. The Kayabas do not have a conventional coil-spring topping cushion.

Both compression and rebound hydraulic damping restrictions are controlled by the piston valve assembly. There are no separate rebound valving systems in the damper body. One set of orifices in the piston is quite large and allows for an unrestricted flow of oil on the piston's compression stroke. Most of the piston's valving restriction is designed to control oil flow on the extension or rebound stroke by diverting it through smaller orifices. As the shock spring applies rebound pressure on the piston a set of washer-like plates close off the piston orifices which cause a hydraulic resistance or drag to slow the recovery rate. Piston-to-sleeve sealing is acquired with the use of a narrow, split phenolic ring. The damper body functions as the sleeve for both pistons.

The shaft is the latest large type with a 12.5mm (.492") diameter. It is hard chrome plated and glides through a fixed rubber seal, which is compressed between the upper two spot-welded top damper body plates. The external sleeve on the damper body is necessary to facilitate spot-welding the pre-load cam bosses. They cannot be attached directly to the damper body because of the critical internal bore dimensions and finish.

The only non-steel parts visible are the

Red Wing
High-Pressure Nitrogen Charged



plastic stone-guard shield inside the spring and the rubber shock-eye grommets. The large spring has a two-rate winding. Our test spring was a 90/160 lbs.-in. coil which fit with less than a ¼-inch preload. Extra-large physical dimensions of the Kayaba and its all-steel construction make it quite heavy and cumbersome to mount. It could not be fitted up-side-down on our Penton and the chain scrubbed against the spring. Tipping the scales at four-pounds, 18-ounces, our Red Wings were about a pound-per-pair heavier than most aftermarket shock assemblies.

After riding at moderate-to-fast speeds for 10 to 15 minutes the Red Wings come up to operating temperature. The Kayabas radiate an enormous amount of heat as compared with low-or no-pressure gas shocks. Initially we considered the high operating temperature indicative of a problem. But the radiation was a healthy sign of rapid heat dissipation.

The high-pressure system provides three specific benefits: it isolates the hydraulic fluid from atmospheric contamination (aeration); raises the oil's boiling temperature; and provides a compressible volume to compensate for the space taken by the shaft as it slides into the damper chamber. A side-effect of the high pressurization is that it works as a secondary spring. Attempting to compress the damper rod requires a substantial amount of effort as 30 to 35 pounds of force are needed to start and complete full compression.

After 150 miles of evaluating we found the limits and benefits of the Red Wings, which were the most versatile of any ever used on our Penton (eight types over 18 months). Ride height was up more than we prefered because eye-to-eye length is ⅜-inch (about a half-inch at the axle) longer than the standard shock. These shocks worked superbly at soaking up small, choppy undulations and delivered an extra-cushiony ride through-out total wheel travel. For all-day riding comfort it excells because it does not react harshly to the majority of bumps.

The Red Wing/Kayabas do not provide fade-free, race-level damping resistance. From cold, they will fade to the point of allowing the bike to pogo or pitch within 20 minutes or five miles of knee-deep whoop-de-dos. For hard, extended-distance racing expert riders require damping characteristics with more fade resistance and consistancy. Also, the available shock (damper) travel is less than most aftermarket units by ¼- to ½-inch, which translates to ⅜- to ¾-inch at the axle. Performance of the spring is as good as on any shock we have tested and much better than most. For trail, enduro and not-so-serious motocrossers the Red Wings are an excellent buy.

The Last Technical Frontier

single wire and coil diameter wire. Pitch (helix angle) and spacing between coils is the same for the spring's total length. One rating is given these springs, such as 100 pounds-inch. The rate of tension is constant at 100 pounds per inch of compression. In four inches of travel the force required for total compression is 400 pounds. Straight-wound springs are commonly used with vertically mounted shocks. These are the least costly springs to produce.

Progressive-rate springs give variable tension rates from full extension to complete compression. This is accomplished in production by varying the pitch angle of the coils. At one end of the spring the wire pitch will be shallow and distance between coils close. The pitch and coil spacing will increase progressively up to the other end of the spring. This variable winding results in a progressive rating like 60/90 lbs.-in. This means, effectively, that a 60 pound pressure is required to compress the spring in its first inch of progress and up to 90 lbs.-in. in the last. Progressive springs with low compression ratings work well with light bikes and soft-damping shocks. High-rate progressives are used to compensate for the falling-rate suspension geometries of bikes with lay down shocks. These springs are somewhat more costly to produce.

Alternate, but not common (or economical), methods of acquiring a progressive rate are to change a spring's wire diameter at some point on its length. Alternating wire diameter of a single spring is impractical and unnecessary in production, since variable-pitch coils accomplished the same result at a much reduced price. However, most factory-level tuners have taken springs to a grinder and removed material from a certain number of coils to alter the rate. Grinding material from the wire is done to alter the rate when a spring is very close to the desired rating and a change to the next softer stock spring is too great a transition.

Coil radius variations, where the top of a shock spring is smaller around than the bottom, are common. They do alter the spring rate at the very top or bottom of compression but the amount is insignificant. The object of reducing coil diameter is usually a mechanical convenience to permit a smaller spring retaining cap. This consideration is important with lay-down mounted shocks where the swinging or pivoting of the units requires additional clearances.

Dual-rate springs offer progressive-like action without having to design special coiling dies. By stacking two different springs together, one soft and one stiff, shocks can be made to soak up small bumps comfortably as well as cope with strong compression forces. For the tuner, dual-rate springs give the widest range of in-the-field adjustability. Often a tuner will play with a dual-rate setup in order to find out exactly which true progressive springs are likely to work best for a particular rider, bike or situation.

Sometimes shock and spring designers goof when mating the two parts. At the advent of the long-travel era, conventional dampers would fail when the shocks were forward-mounted. The additional leverage multiplied the compression force on the shock enough to cause repeated hard bottoming. The rubber bumpers would fatigue and allow the piston shaft to make metal-to-metal contact with the foot valve which caused irreparable damage to the damper. Just about all shocks are now designed so that this metal-to-metal contact is not possible even if the bumper were removed.

Measuring available spring travel is important when swapping them from one brand of shock to another. There are instances where a spring cannot be changed from one shock to another even if they are the same brand. Due to the variations in available travel of different damper models, some springs can coil bind, or bottom, before the piston shaft moves full travel. It is best to install the spring and retainer you desire to use on the damper for measuring. Move the cam adjuster to maximum pre-load and measure the total available free-space between coils. After this is totaled the optimum travel of the damper shaft (including bumper height) must be measured. The available spring travel must total more than that of the damper. If shock travel is greater than the spring's the result will be damage or breakage of the spring retainer, pre-load cam or it's retaining bosses.

At this time there seems to be no particular limit to suspension travel and innovation. Some of the 1977 Grand Prix works motocrossers are going to have a full-12 inches of travel—front and rear. Ten inches is the current accepted minimum with the works bikes and production racers are averaging eight to nine. Configurations abound—forward mount, lay-down, long shock, monoshock and the latest far-forward cantilevered systems are nearing production lines.

The perfect shock is not yet in sight. But present aftermarket shocks are vastly superior than those available a few years ago. We have seen very few "bad" non-OEM shocks in the past year. Most accessory shocks are adequate or good and will serve the needs of the vast majority of riders. In reality, only top expert or professional racers require shocks which are any better than those you can buy over the counter. The rest of us have never had it so good. ◉

• The approach S&W has taken to isolate hydraulic shock fluid and and provide piston shaft compression space is novel, if not new. The Monroe-of-Michigan-made S&Ws are non-pressurized conventional dampers, with a freon-filled plastic gas bag as the compression chamber. The original design of the gas bag system came from the auto industry's need to eliminate the air/oil mixture in horizontally-mounted steering dampers. S&W saw the benefits of this concept and adopted it for motorcycle shock usage.

Construction of the S&W dampers is all-steel. Other than the alloy pre-load cams and spring retainers, no aluminum is used in the S&Ws. Shaft diameter is 12.4mm (.488") and maximum available travel of our 13⅜-inch shocks is just under 4½-inches. A three-lip neoprene seal is used to prevent leakage around the shaft. The piston ring is an extra-wide, ¼-inch, full-circle nylon molding which minimizes fluid blow-by.

The piston is a two-way valve which controls compression and rebound damping. Orifice washers are fitted on the top and bottom of the piston to allow the desired amount of oil to be passed during compression and rebound strokes. A coil spring is used to pre-load the bottom set of washers. The seamless steel piston sleeve has a one-way foot valve in its base. On the rebound stroke, the piston draws fluid up through this valve. On compression, the foot valve closes to force all the fluid dispersion to take place with the oil confined in the sleeve. This system forces the oil to recirculate from the sleeve bore through the damper body during rebound cycle strokes.

S&W does not use a coil spring or separate hydraulic damping as a topping device. A special ¼-inch thick urethane washer is incorporated as a topping bumper. The hydraulic fluid is a 3- to 5-weight oil, developed by Monroe.

The design and construction of S & W's gas bag concept is more intricate than the bag's appearance would suggest. The bag material is a special high-density nylon—not just plastic. Other materials used initially for the bags proved to leak as well as absorb gases. Freon was found to be the most practical inert gas to use, since it has a large molecular structure and would leak through the bag's walls less readily than other gases.

The nylon freon gas bag is placed in the shock between the piston sleeve and damper body. Dampening fluid entirely fills the damping body except for the space occupied by the freon bag. The shock is then permanently sealed by Monroe. This procedure virtually eliminates any air contamination of fluid and it is accomplished without pressurizing the shock. By not pre-pressurizing the damper assembly there is a minimal

amount of seal drag and no spring-like rebound characteristics which can complicate spring selection.

The S&W shock assemblies are quite light considering their all-steel construction. Each shock weighs an even four pounds. We could not fit the S&Ws in an inverted position on our Penton, because the spring retainers hit the swing arm when the shocks were compressed. They offered no interference problem with the chain. The split, dual-rate spring set-up delivers progressive-like rebound action. The lower rate spring is a straight-wound 90 lbs.-in and the higher is 160 lbs.-in.

Use of the spring pairs gives the rider more versatility with changing rebound rates. S&W will have alternate windings available for both spring rates. This will allow stiffening or softening the initial or secondary rebound rates without dramatic changes in the remaining spring's performance. The shorter, softer springs are used in the first inch and a half of travel to absorb small bumps. The longer, stiffer springs soak up the whoop-dee-doos and sharp dips.

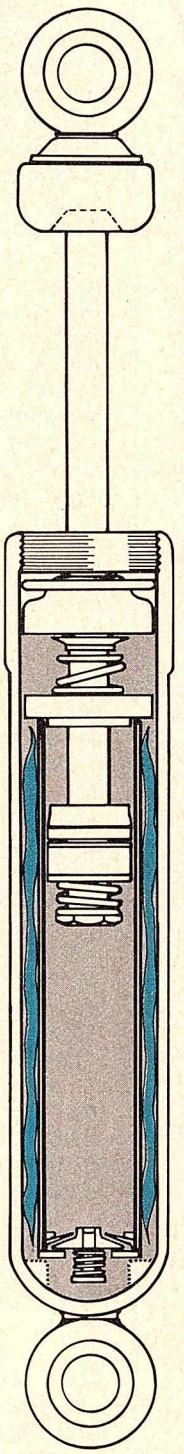
In the lay-down position, the S&Ws deliver a supple ride in the initial four inches of wheel travel. They allowed our Penton to run comfortably over choppy trails and roads without producing a chattery washboard effect. Damping in the lower half of travel seems to be perfectly matched to spring tension. And by moving the pre-load cam up and down its half-inch of adjustment we could set the ride height to suit rider and terrain variations.

The upper half of the shocks' movement was used extensively in our knee-deep whoop section. The spring/damping rates and performance were nearly ideal for our useage. When riding full-blast through the whoops for a few miles we found the shock performed much better if the pre-load cam was moved to its top adjustment notch. This made the shock rebound quicker between each whoop and alleviated a slight pump-down problem. At the end of the eight miles of whoops the S&Ws were faded somewhat but not enough to cause major handling problems. After cooling to more normal operating temperatures they recovered full damping.

The S&Ws performed better as more miles were put on them. After 125 miles they had normalized and delivered more consistent performance in the transition from cold to hot. They were as pleasureable to use for trail riding as they were for race-like conditions. The damping fade might be too much for the requirements of top professional riders who race big-bore motocross bikes. Most expert motocrossers, desert racers and enduroists will find the S&Ws nearly perfect for their demands because of the supple ride and acceptable damping fade.

S&W

No-Pressure Freon-Celled



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THE SHOCK DYNO

The motorcycle shock absorber dynomometer is a specialized instrument used to measure hydraulic damping forces. It is a distant relative of the engine dynomometer, which measures mechanical power. The shock dyno tells us how much resistance a damper has to input energy. The engine dyno tells us how much energy a motor produces working against a resistance. Motorcycle shock dynamometers are not standard industrial hardware like engine dynos. They are one-offs built to individual specifications and requirements.

We used S&W's mechanical shock absorber dynamometer as a comparative measuring device for our three test damper units. S&W's dynamometer uses a simple crankshaft, connecting rod and cross-head to deliver fast, forceful compression and rebound strokes to the damper units. Since a crankshaft system produces variable speeds at the shock piston our force or energy chart (curve) is elliptic in shape rather than vertical or horizontal.

What is shown as an energy resistance chart is actually a photograph (taken at a very slow shutter speed), of a trace on the oscilloscope attached to S&W's dynamometer. Each elliptical loop represents one complete test cycle. Shock stroke is constant at two inches and cycle speed was varied from 100 to 300 (in 50 cycle increments) cycles per minute. Operating temperature was maintained at 100°F. Changes in cycle (damper piston) speeds cause different resistance curves to be formed on the oscilloscope.

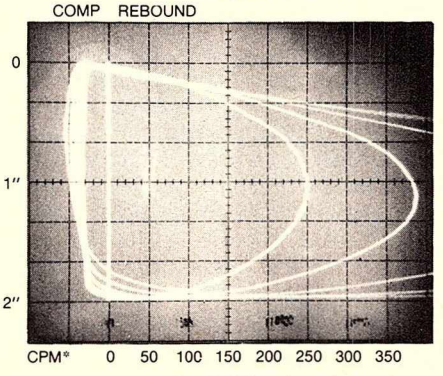
What you see as shock performance curves are graphic representations of what their damping is like at different cycle speeds. The amount of resistance a damper unit delivers at a specific number of strokes per minute cause variations in the curves. Vertically, the performance chart represents shock stroke, (travel) which is two inches. Horizontally the graph indicates resistance in pounds. To the right of the zero (0) resistance line is rebound damping; to the left is compression damping. Each elliptic curve is formed in a clockwise direction. At the top we have compression; at the bottom, extension. Peak piston speed is in the center of the chart.

The shock dyno performance curves tell the layman little more than if there is a valving problem or fluid fatigue in a damper unit. These would be indicated by blips or abnormal dips in the curve(s) where there is a sudden increase or decrease in resistance. Abnormal heat rise would be apparent if the curve(s) shifted inward (showing lower resistance) drastically in a short time.

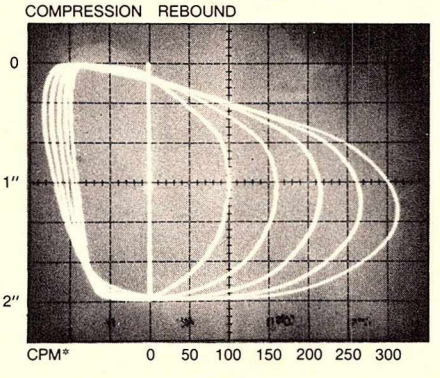
Performance information with regard to pounds of resistance, force per inch per second, at certain stroke speeds and specific temperatures are decipherable only by the few hydraulics specialists that use shock dynamometers as a test bed tool. The resistance energy figures must be fed into numerous complex formulas related to weights, piston speeds, leverage acquired with various attachment points, anti-squat and pro-squat designs of individual motorcycles and spring rates. Even with all the formulas in hand, the dyno is only a narrow kind of measuring device. It tells you something about what you have but does not allow designers to build the ultimate suspension system.

The best hydraulics and suspension engineers still guess and compromise with shock design—even with the dynamometer performance figures in hand. The one uncontrollable variable is also the final performance dynamometer—the rider. Because of this variable there is no such thing as the "ideal" shock dyno curve.

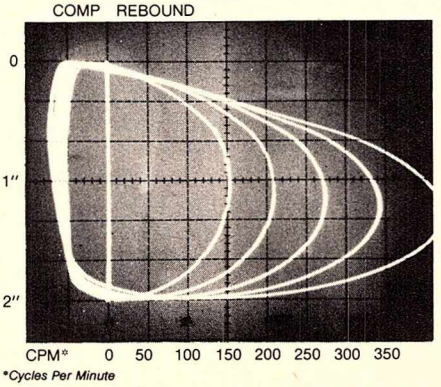
Marzocchi



Red Wing



S&W



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Add it all up and it's pretty easy to see why Datsun is America's Number One Selling Small Pickup.

Product Evaluation

CAMBER FAIRING

What happens when America's leading manufacturer of road racing fairings decides to build a touring fairing? The Camber '76.

● DIFFERENT ENTHUSIASTS ENJOY DIFFERENT THINGS ABOUT MOTORCYCLING. If you doubt that proposition, play the devil's advocate and tell some pure-blooded sporting rider (who walks around in a semi-racing tuck) how neat touring fairings are. In short order you will learn that motorcycles are sporting conveyances, and that heavy touring accessories slur the communication between man, machine and the road below. And *that* experience is the vital, compelling center of motorcycling.

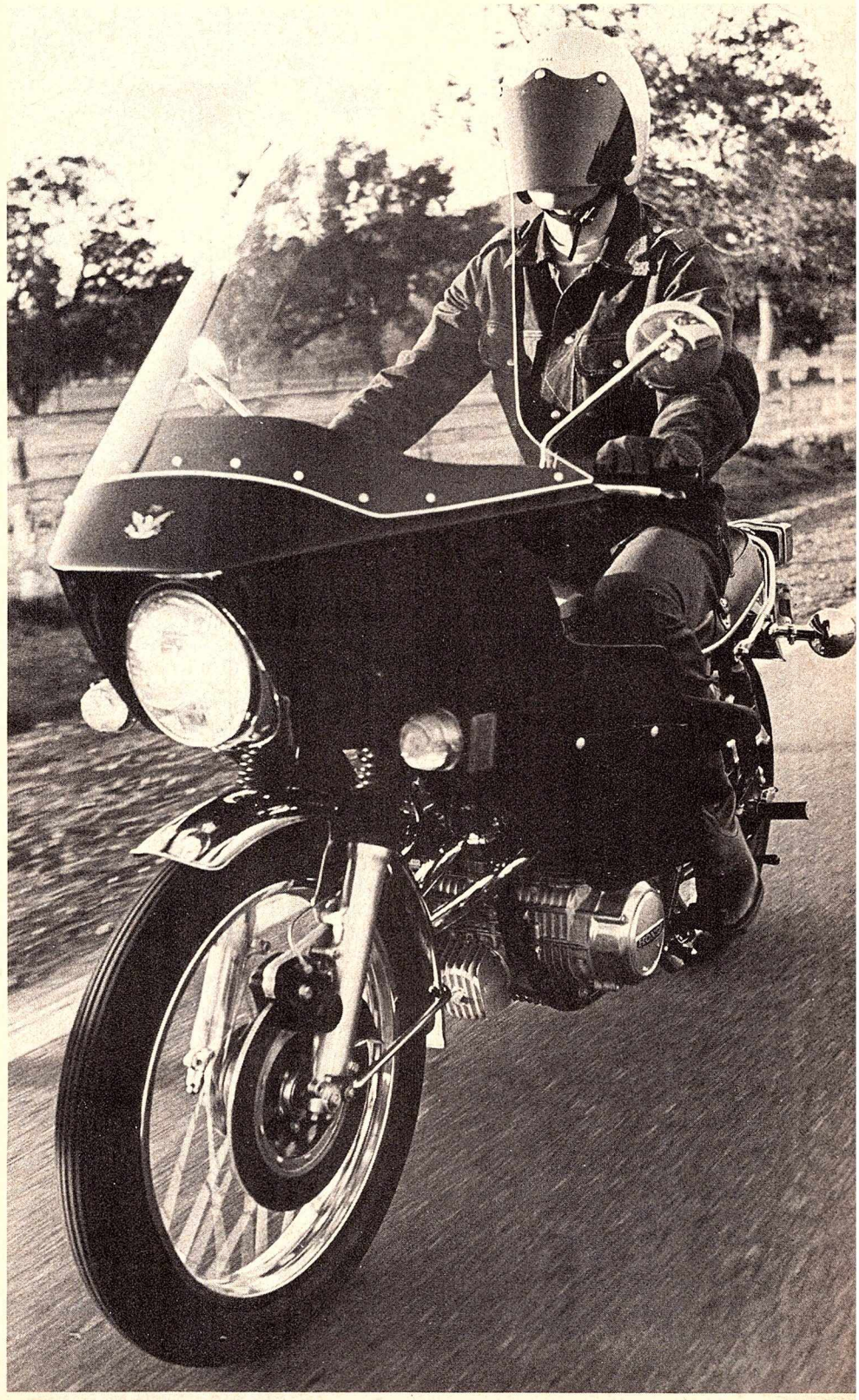
Or bait the issue from the other side. Tell some long-distance rider that touring fairings are really dumb. You'll quickly be informed that you know nothing about real motorcycling: the open road, the campground scene, the miles behind and places ahead. No one has built the motorcycle that couldn't be improved by accessories, and being comfortable is a mark of progress. In these modern times people live in houses with roofs, use hot-and-cold running water, and even enjoy air-conditioning. He who says today that touring fairings are effete probably thought the same thing about swing-arm suspension in 1950. Motorcyclists need not be masochists.

The Camber Company does business with motorcycling's sports and its true-blue highwaymen. For years Camber has made a variety of road-racing fairings as a vendor to works teams and supplier to a multitude of privateers. Within the last two years, the company has entered the touring market with the Camber '76 fairing, a frame-mounted unit with its own very distinctive design.

Features are important in the touring trade, so features the Camber '76 has. The headlight, of course, is built in; and with the Vetter adapter a BMW quartz headlamp can be installed. The Camber '76 comes with directional signals/side reflectors (same as MV Agusta standard issue), Dzus-fastened lower side-panels, a neoprene cover for the standard headlight shell, removable tote bags, and an instrument panel which provides access to the electrics and space to install accessory gauges—or a radio, cigarette lighter or whatever.

Camber offers this fiberglass fairing in black or white gel coat finish for $280 FOB Costa Mesa, CA. An additional $85 buys custom-color matching, including pinstripes and fogging.

It's no secret that some fairing com-



CAMBER FAIRING

Almost anyone can build anything in fiberglass. The trick is producing a high-quality fiberglass product time after time.

panies have switched over to ABS plastic construction, escaping the rising cost of fiberglass resin (a petrochemical) and production problems (shrinkage, mold warpage) that often lead to poor fits. In many ways these problems trace back to the apparent ease of manufacturing fiberglass products. Almost anyone can build something in fiberglass—superficially, it's simple. But to build a really high-quality product in fiberglass, and replicate it again and again, is incredibly difficult.

In Southern California craftsmen like Jerry Greer (the principal in Camber) have vast experience with the medium and a lot of production know-how; furthermore, there's a labor pool of expert workers familiar with fiberglass lay-up. There's little waste in manufacturing, and a product of consistent quality comes off the lines. At Camber no chop-guns spit fiberglass silage; the fairings are laid up in fiberglass cloth. Camber does superb work, period.

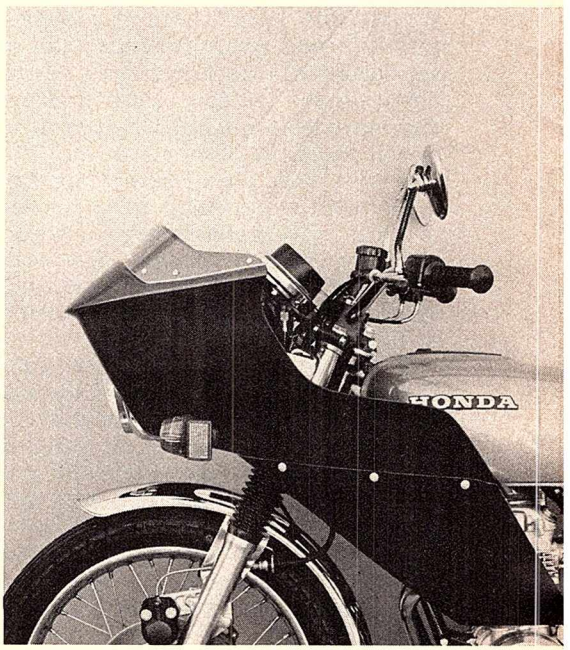
The Seventy-sixer has a smooth gel coat finish inside; there's none of the fuzzy matt black stuff so popular among touring riders. Nor does the company offer windshields of various heights; the screen is cut so that a six-foot rider can look over or through the windshield. There are no electrical jacks enabling the installer to plug in the headlight and turn signals straightaway; you connect individual wires from the fairing to the appropriate ones inside the headlamp nacelle. But the Camber unit has clever touches. For example, neoprene boots interface between the frame and the frame-mounting hardware. These cushions serve as noise dampers and prevent the mounts from scratching the frame. The boots will fit on any mounting hardware that follows the Vetter pattern.

The Vetter-style bracketing is almost an accessory-industry standard now. While we're not overwhelmed by the use of hose-clamps to secure the mounts to the frame, the clamps are effective and inexpensive. Both the hose-clamps and the neoprene interface-boots produce a mounting that is solid, but not rigid. Consequently the rider will see some slight cowl-shake while riding along, but this movement is characteristic of all frame-mounted accessory fairings.

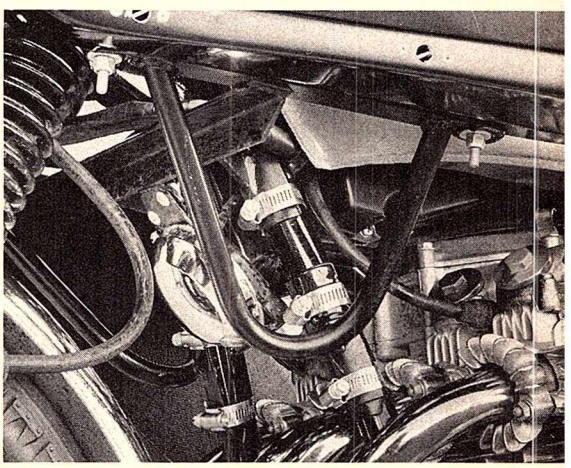
Greer has given the Camber fairing its own appearance; the Seventy-sixer isn't a remake of Craig Vetter's much copied Windjammer. Camber has neither the need nor inclination to imitate for at least a couple of reasons. First, Jerry Greer knows a great deal about controlling air around a vehicle. Not only has he built his fair share of motorcycle racing fairings but Camber has also fabricated bodies for four-wheeled racers, including Formula 5000 and Indy 500 cars. Because Greer understands how fairings manage air, he could exercise his keen styling sense and still make a fairing that would function for the touring rider.

The Camber fairing directs air around rider; the lowers are wide enough to cover legs entirely.

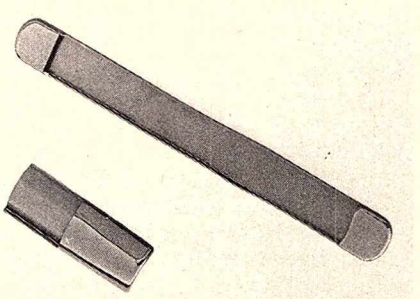
Any maker is pulled and stretched by manufacturing economics. One size must fit all. Or nearly all. Consequently small detailed alterations may be necessary to get a fairing and/or its accessories to fit a specific model. For example, the Honda CB550 turn-signal stalks screw on small stubs which extend about three-quarters of an inch outward from the headlamp holders. These stubs did not foul anything, and we hesitated to saw them off since the Honda 550 would be restored to stock configuration after the fairing evaluation. When the tote pouches were clip-

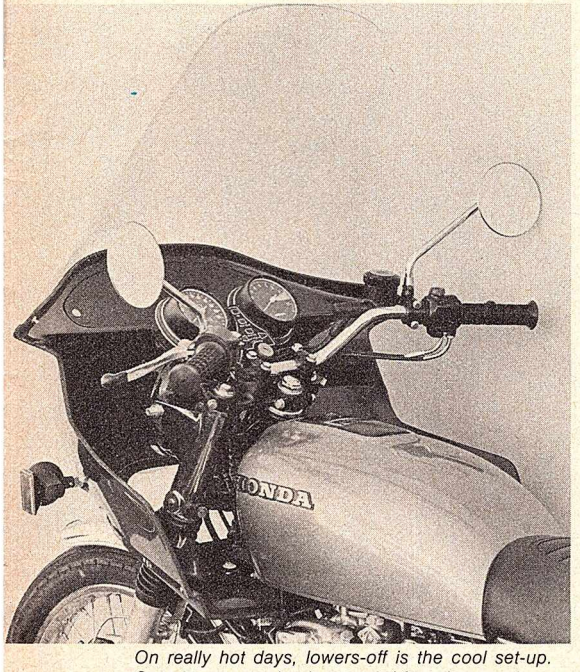


Headlight, pointing down here, can be adjusted for proper light path; Dzus fasteners secure lowers.

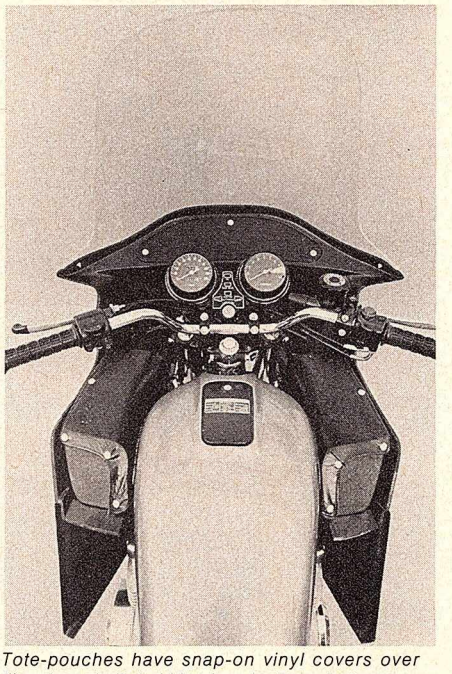


Brackets mounted to the frame via hose-clamps which may require periodic re-tightening. Neoprene covers (below) interface between brackets and frame and fairing, damping noise and vibration.

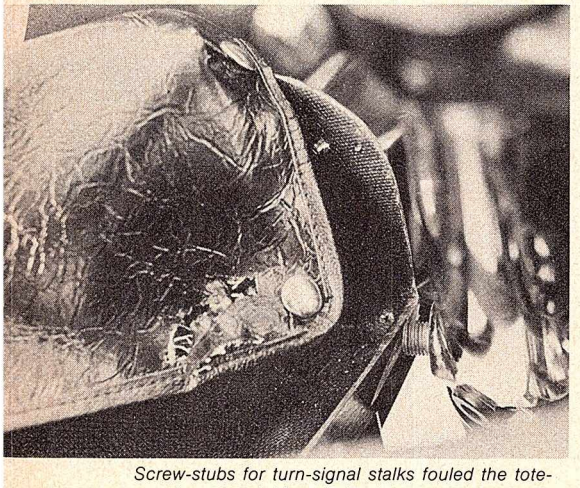




On really hot days, lowers-off is the cool set-up. Sans lowers, engine is exposed for minor work.



Tote-pouches have snap-on vinyl covers over fiberglass shells held in place by Dzus fasteners.



Screw-stubs for turn-signal stalks fouled the tote-pouches. Careful installation is a must.

ped into place, the screw-stubs hung up on the fiberglass pouch-bodies and eliminated most of the motorcycle's steering lock. In fact one screw-stub dug into the naugahyde cover on the left-side pouch just as we caught the problem. The screw-stub/tote compartment was the only real snafu, and one which could be solved by buzzing the screw-stubs off.

At certain speeds touring fairings can operate like loudspeakers, picking up and amplifying sounds in the motorcycle. It's characteristic of the breed. Of course the same motorcycle will project different noises inside different fairings, and conversely two different motorcycles using identical fairings will transmit different sounds. The Honda 550 Super Sport produced an annoying fifth-gear whine between an indicated 46mph and 59mph; consequently we used fourth gear through this speed range and avoided the noise. Generally the Honda 550 engine runs quietly, making the bike suitable for a touring fairing. Obviously motorcycles with clattery engines are poor candidates for any resonating accessory—unless the rider is deaf.

Most touring-types are willing to accept some extra engine noise in order to escape the frontal assault of wind and weather. In the trade, those riders get a place for accessories like clocks and gauges and lighters, and extra stowage space for incidentals such as gloves and road maps.

A good touring fairing will create a dead-air pocket around the rider. The Camber dead-space extends back to the rider's head, chest and hips; the windshield directs the air over the head and around the shoulders. The rider can pass his hand from the instruments back to his belt buckle, and detect nothing but still air.

There is some air movement in two places, but nothing that qualifies as a real draft. The rider's hands are exposed to some slight turbulance, and a column of air moves up the fork legs, divides and exits along the lower portions of the gas tank. Somehow very little of this air spills back to the rider's knees; the air seems to dump out over the sides of the fairing and/or be drawn back down in the engine bay. With the tote pouches Dzus-clipped into place, air flow back to the rider's knees is really blocked.

At the legal speed-limit and far beyond, the fairing keeps air off the rider, and the faster we went—upper limit 90 mph—the more effectively the Camber fairing managed the air. The 550's stability did not suffer due to the fairing. The rear shocks on our test bike had lost what little damping they possessed before the fairing was mounted, and the rear-end-uncertainty was still evident after the unit had been bolted on. Aware that some touring fairings can aggravate limp suspensions, we fitted fresh S&W air shocks. Presto, stability restored.

Before installing a handlebar or frame-mounted fairing, common sense dictates that you replace worn-out shocks, check the operation of the front suspension (Spring sag? Proper lubricant in the correct amount? Any binding?), inspect the head bearings for slop, get the wheel alignment correct vertically and front-to-back, and have compatible tires free of any funny wear-patterns.

Sometimes strange wind conditions, or a combination of road and atmospheric conditions, can produce bizarre noises in a touring fairing, or cause the motorcycle to handle peculiarly, or even wobble. Though the fairing never upset the stability of our test 550, at one time a headwind induced a high-frequency sizzle in the windshield. We later tried to provoke the flutter again, but the phenomenon proved unrepeatable.

Removing the side-panels exposed the rider's lower legs to the air stream and generated different kinds of noises. Not as much sound came up from the engine bay, but there was more wind noise. It's also possible that removing the "lowers" caused the main fairing section to be more suspectible to air buffeting. With or without the lowers, the Camber '76 gave outstanding head and torso protection, but the fairing provided optimum coverage with the lowers and tote-bags attached.

(Continued on page 117)

Ford. First in vans by a comfortable margin.

Shown with owner-added striping. Wheels shown are optional. Check your local Ford Dealer for availability.

Customized for "Cruising."

Industry's first customized van. Factory built fully—Inside and out—a look that sets you apart in a crowd.

Loads of livin' room.

Add your great ideas to ours. Optional swivel Captain's Chairs, too!

Ford's out front in vans—in more ways than one. First with the van concept about 15 years ago. And first with an advanced out-front design. We moved the engine forward so you have more room and downright comfort. And did a lot more. Put yourself in the leader in vans—put yourself in a Ford!

Wild! Ford's new "Cruising" Wagon.

Part wagon, part van, all fun.
Ford's restyled Pinto wagon up front,
wide open van room in rear.
An Industry exclusive!

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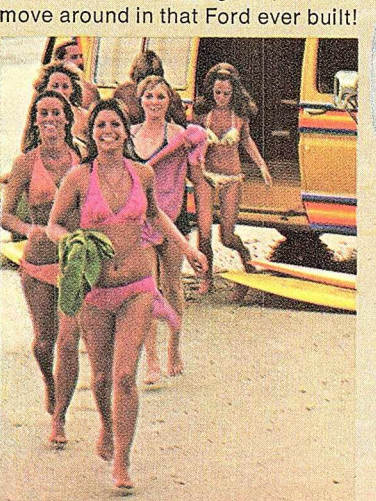
It's the easiest van to get in, out and move around in that Ford ever built!



Built Ford Tough

93 out of 100 of all Ford Trucks registered over the last 12 years are still on the job.

FORD

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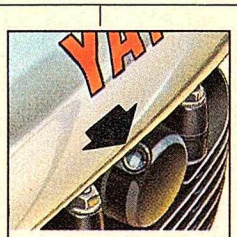
The 1977 Yamaha TT500:

Few motorcycles deserve to be called legends. Fewer still manage to lay claim to that title after just a single year of production. But the Yamaha TT500 is unlike any other machine. It is, quite possibly, one of the most significant advances in dirt bike technology ever to appear.

New, improved Thumper.

The TT500 concept is based on the classic Thumper—the four-stroke single machines that dominated off-road riding in the 1950's. Like them, the Yamaha TT500 is a supremely simple motorcycle. It's reliable, easy to maintain, with tremendous low-end torque. But with the aid of modern engineering, the TT500 is also much more.



The TT500 Kick Indicator Window. To avoid fighting the tremendous compression of this engine, (1) merely depress the compression release lever on the handle bar, (2) slowly turn the engine over until the silver marker fills the window as shown. Now the piston is past the compression stroke and (3) the engine is ready to be started.

Engine torque.

The engine is a work of art. No four-stroke single is more advanced. In place of old style push rods, the TT500 uses an overhead cam. Some parts are made of lightweight magnesium, a practice usually reserved for racing bikes. A 32mm Mikuni carburetor and a 9.0:1 compression ratio help produce usable torque from idle up to 6000 rpm.

Kick starting an engine of this size and power is often difficult. But with the

New kick indicator window for easier starting.
YAMAHA
TT
500
7
New high pipe with U.S. Forestry-approved spark arrestor.
Cantilevered nitrogen/oil shocks provide 5.7 inches of travel.
Full 9.2 inches of ground clearance.
Massive clutch has over 100 sq. inches of surface area.
New lightweight aluminum skid plate.

The makings of a legend.

Aluminum alloy piston and cylinder for better heat dissipation.

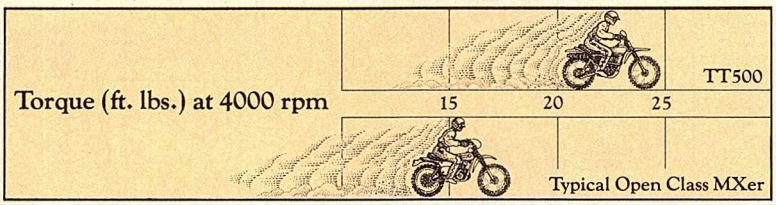
Front forks offer 7.7 inches of travel.

TT500's compression release and new kick indicator, it's not. (See insert.)

A dry sump lubrication system utilizing modern trochoidal pumps keeps the crankcase size to a minimum, so ground clearance is a healthy 9.2 inches.

For serious riding a new high pipe has been added, along with a new aluminum skid plate.

Last year, proof of the engine's ultimate winning capabilities was witnessed in tough race competition throughout the country.



Hard off-road riding demands huge amounts of low-end torque. A TT500 develops more of it, up through 4000 rpm, than many large displacement motocross racers.

Refined suspension.

Modern Cycle noted, "(The TT500) can just about out-drag a full-blown Open class MXer to the first turn." And the suspension is up to it. At the front, the forks have a generous 7.7 inches of travel. Shocks are the cantilevered nitrogen/oil type. The ability of these particular units to handle small irregularities as well as larger bumps has been refined to a new level of excellence. In the interest of reducing unsprung weight, the leading/trailing shoe brakes have magnesium backing plates attached to lightweight conical hubs.

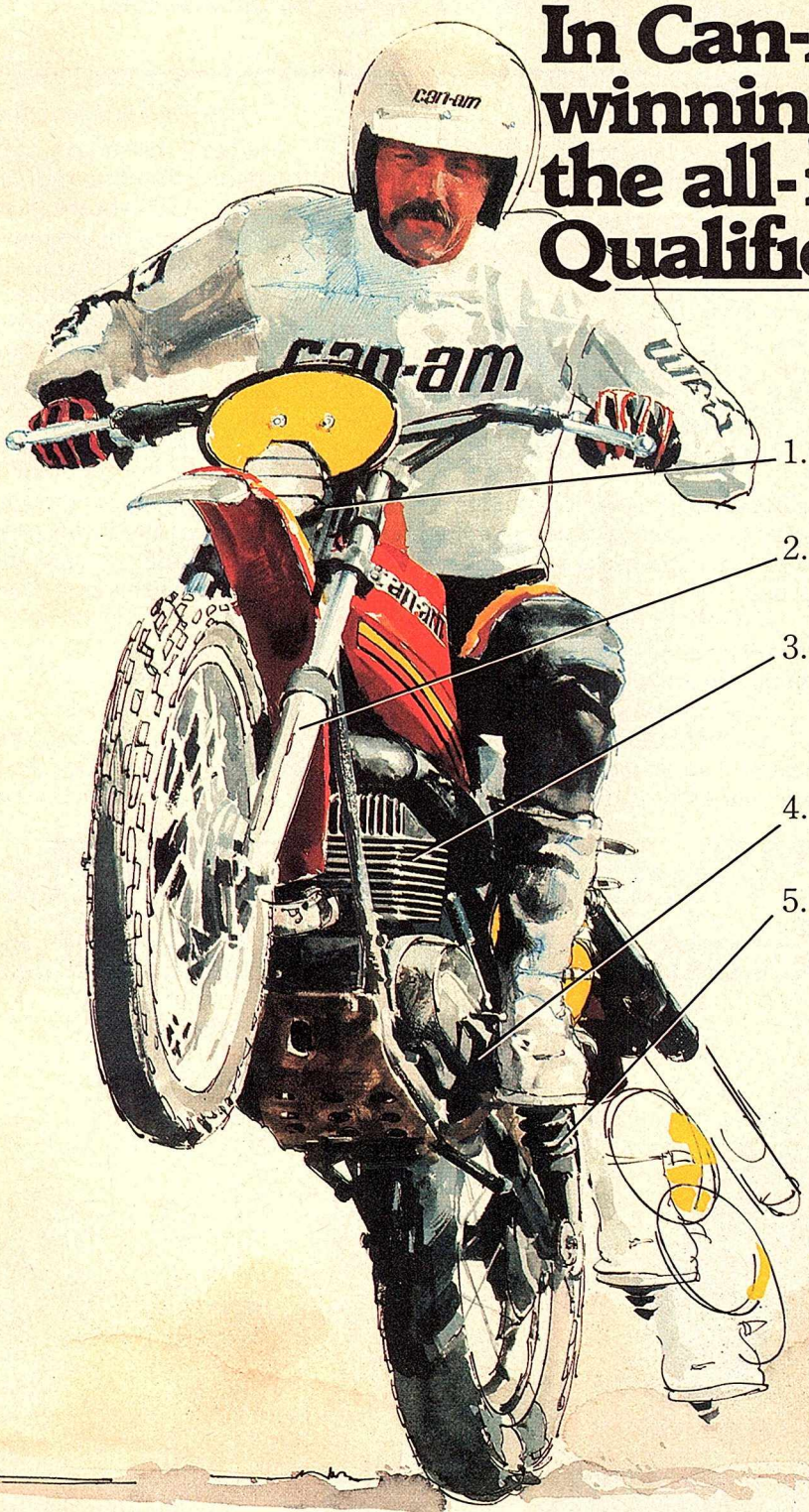
Yes, a legend.

The Yamaha TT500 is more than just another dirt bike. It represents an undisputed engineering breakthrough. It is a legend in its own time.

When you know how they're built, you'll buy a Yamaha.

CIRCLE NO. 33 ON READER SERVICE PAGE.

In Can-Am's winning tradition, the all-new Qualifier* enduro.



1. Adjustable fork angle —25° to 31°.
2. Betor telescopic front forks, 7.5 inch travel.
3. Rotax engine with broad power band. Rotary valve induction.
4. Close-ratio six-speed gear box.
5. New gas bag shocks —7.3 inch travel at rear wheel. Mounted in the lay-down position.

Can-Am rider Skip Olson— 2nd Overall in the National Enduro Circuit on a Can-Am 250.

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CAN-AM* QUALIFIER*

Can-Am makes winners.

Can-Am bikes have long been winners. On motocross tracks, on enduro circuits.

But Can-Am has never built an enduro bike. Until now. No more need to add lights to our MX. Or to strip down our T'NT.*

Can-Am now builds an ISDT-type bike. A lot of good dirt riders are going to win on it. Maybe you. The Can-Am Qualifier. In 125 cc, 175 cc and 250 cc. At your Can-Am dealer.

can-am*

Motorcycles by Bombardier.

DUCT TAPES ..... *Continued from page 12*

get their hands on them. The only part of Woody's deathbed layout I changed was a shallow stream crossing that turned into a raging torrent whenever it rained east of Altoona, Pennsylvania. By rerouting and crossing on the Jersey Central trestle I added two tenths to the mileage. I was backtracking to cut a corner and get my two tenths back when I was almost killed.

I was running a gravel road near Jemima Mountain when up flicked a branch about the size of a baseball bat which landed right in my lap then bounced over the side and stuck, point-on, in my countershaft sprocket. The Bul went "whump" and I found myself sliding with a locked up back wheel and the thing hopping off the ground and throwing the back from side to side with each bounce. I have never yet ridden one of these calamities to a standstill; I get off around twenty miles an hour. One of the nice things about an early Matador is that the handlebars swivel when you crash and the bike doesn't flip around breaking things. One of the bad things about an early Matador is that the handlebars swivel when you crash and punch the front brake ball end right through the gas tank. Mine has been repaired so often it looks like a fiberglas wart. A nice solid hole will merely reduce your fuel capacity but a crack in the tank is another matter; the evaporative quality of gasoline being what it is, it is possible to enjoy the distinctive sensation of heat prostration and a frost-bitten knee at the same time.

I tried to roll my machine backward to get the jammed wood out, recalling I'd once seen Clarence Hyde pick his 500 Triumph up about three feet then hurl it, backward, at a forty-five degree angle against the ground to resolve much the same problem. All I got was slide marks. The master link was on the bottom of the chain so I pulled it off, rolled the bike forward until the chain was sagged way down and almost off the back sprocket, then rolled the bike backward fast as I could to jerk the wood out. I got more slide marks. I took my vise grips, gnawed as much wood as I could from the countershaft then removed the seat and gas tank. I leaned the denuded frame against a stump, dribbled a pint of fuel onto the thirsty wood then threw a match at the bristled end. I was glad there were no other riders around, as I'd been called a backyard hack by too many people. Come to think of it, it was Woody who first called me a backyard hack; he went around telling every body I relined my clutch with sheet cork and contact cement.

It was true, of course, but he shouldn't have *told* everybody.

After the fire died the charred wood broke out easily but the thing had stopped so fast that it sheared the drive keys on the clutch and flywheel. I said shucks, by actual count, twenty-four times as I hooked the chain together and slammed the tank and seat back on. It was a three mile push back to my trailer but I was overjoyed when I got there for I was almost killed on the way. I had gone about a mile, plodding silently along with the transmission going, "ticktictoktic, tictic-toctic" and was near a marsh, the vegetation lush and thick compared to the usual stunted Jersey pines. The "tictictictoc" of the gears seemed to get louder. I saw a slight movement as I passed a clump of thick brush and froze; the movement was the eyelids of a terrified man, ten feet away, fluttering with the tension of holding a hundred-pound bow at full draw. I was bore-sighting down the shaft of an arrow and looking right through the hole of an arrowhead shaped like an apple corer! I had been scared when a gun was held on me but this was bad; a gun just might not be loaded, with a bow there is no doubt. Slowly, he released the bowstring then sank to one knee. "Thought you were a deer," he wheezed, totally drained.

So, gang, if you ever have to push a dead bike during hunting season I suggest you hum, whistle or sing your favorite song, and if you're throat is all burned out and you're spitting cotton, hang your helmet from the bars and rap it against the tank once in a while.

—Ed Hertfelder

Weathersealed to protect contents from dust and rain.
Permanently mounted tops, concealed front hinges, and chrome lid stays.
Custom Mounts are available for most touring bikes.
King Size Bag holds "Star-type" helmet—plus more.
Stainless steel 5-pin cam locks.
Easily fits nearly all luggage racks.
Holds two helmets plus other things.
Two-inch-thick Backrest Pad.
Side safety reflectors.
Hand-polished chrome plated Bag Guards.
Combination stop, tail and directional light.

First Class Accommodations

Extra-large carrying capacity, top styling features and high quality construction...three important things to look for when choosing Saddlebags or Tote Boxes. Bates has them all in these beautiful, hand-polished fiberglass accessories. Also, your choice of colors, striping and Guard Rails. For future fun and enjoyment from touring, why not go first class with Bates today?

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Custom Colors: ☐GL 1000 Red, Lemon ☐Z-1 Brown, Green
Fiberglass Saddlebags ☐Black ☐White ☐Custom Color $25.00 ex. $_____
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Fiberglass Tote Box ☐Black ☐White ☐Custom Color $15.00 ex. . _____
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Plus shipping and insurance (10% or $10.00, whichever is less) .... _____
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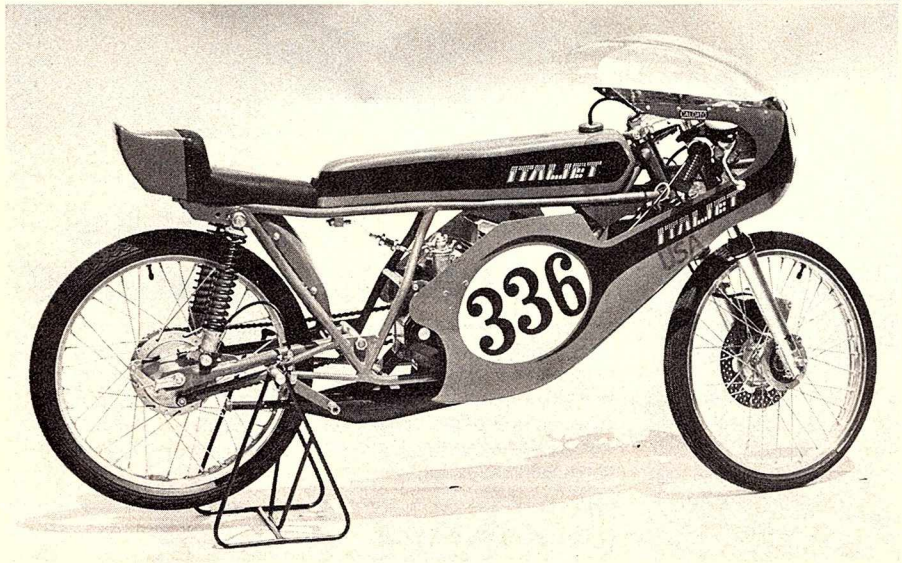
Send order to **Accessory House, Box 1770-CB, Long Beach, Calif. 90801** and include your complete name, address and telephone number.
☐ $2.00—Rush me all the full-color Bates Accessories and Leathers Catalogs.

Off To War On An ItalJet 50

That right—a 50. Your Faithful Correspondent was invited to a day at the races by ItalJet USA. Dozens of laps and a half-gallon later, his verdict was in: 50cc racing may not be much for speed, but it's long on fun—especially if you have some imagination.

By Cook Neilson

PHOTOGRAPHY: JOHN ULRICH



● EACH BIKE GLISTENING beneath a heat lamp and surrounded by its own factory mechanics, the ItalJet road racers crouched within the otherwise dark confines of Ontario's Garage 3, Building 3. They look as purposeful as javelins, I thought to myself; willful, wicked, snappish, unpredictable, true By God Grand Prix racers, at peace for now but able to snarl to life at the drop of a clutch and lay to rack and ruin everything about them. Three shining, tiny war machines, here at the track to Do Some Business, to crush some reputations, to whack the privateers around and send them snivelling as only privateers can snivel, to explore the uncharted dimness of speed/time continuums, to demonstrate to the few emotionalists still in racing that technology and track-side pay windows go hand in hand and to show beyond a doubt that people willing to pay the Divine Cost of Winning will blast off the face of the earth the racer who antes up nothing more than the Piffling Price of Participation and who, until he shuffles off his mortal K-Mart coil, will savor naught but the bitter dregs of defeat, or worse.

I walked past the security guard, Onofrio Violente, and into the *sactum sanctorum* of the garage. As many as a dozen spare fairings hung from the electrical conduits overhead. Piled neatly in the far left corner were unopened crates filled with experimental engines, the boxes coded with security clearance numbers and lettered with threats against the unauthorized. A small chemical laboratory was arranged to the right; a technician and his assistant were furiously brewing up special fuel mixtures for each of the three celestial racing machines. The building hummed with quiet intent; only rarely was the work at hand interrupted by an outburst or profanity.

"I'm glad you could make it," greeted Mario Caldato, Sr. Mario is ItalJet's U.S. competition chief. He used to race in Italy and Brazil, and maintains a full-scale race shop in his home. He introduced me to the rest of the team mechanics: Winslo Homerio, George Bignotti, Arturo Toscanini, Vespa Onafifti, Ludmilla Turischeva, O.J. Simpson and Vidal Sassoon. "These men come from different backgrounds, different professions," Caldatto explained. "I don't want mechanics and tuners with their own ideas. I just want men who can take orders, men whose backgrounds have trained them to a high degree of precision, men whose quest for perfection matches my own."

Perfection? I could see it in every nuance of tiny Number 31, the bike I was to ride this day. Wheel spokes as fragile as angel hair, a fuel tank narrower than the span of a hand, a fairing delicate as an insect's wing, a chassis as whimsical as a Lithuanian flute solo, a chain hand-carved from a single slender chrome-moly billet, the front brake disc drilled full of perfectly-spaced collander-sized holes. Were Leonardo to create a motorcycle it would look like my ItalJet: perfectly dimensioned in keeping with the Golden Mean, lean yet slender, visciousness lightly veiled, smoothly striated with power, a paradigm of mechanical beauty taken to the third, and highest, level.

A knot forms in my gut as my eye sweeps spray-gun-like across the liverish lilliputian. Fifty. I keep reminding myself it's a Fifty. Three cubic inches of power unrestrained, three of the most deadly cubic inches ever seen in the United States, power to spare in a package that weighs no more than a dipswitch. Serious business, I remind myself. Was not Booth's pistol tiny? And look at the trouble *it* caused.

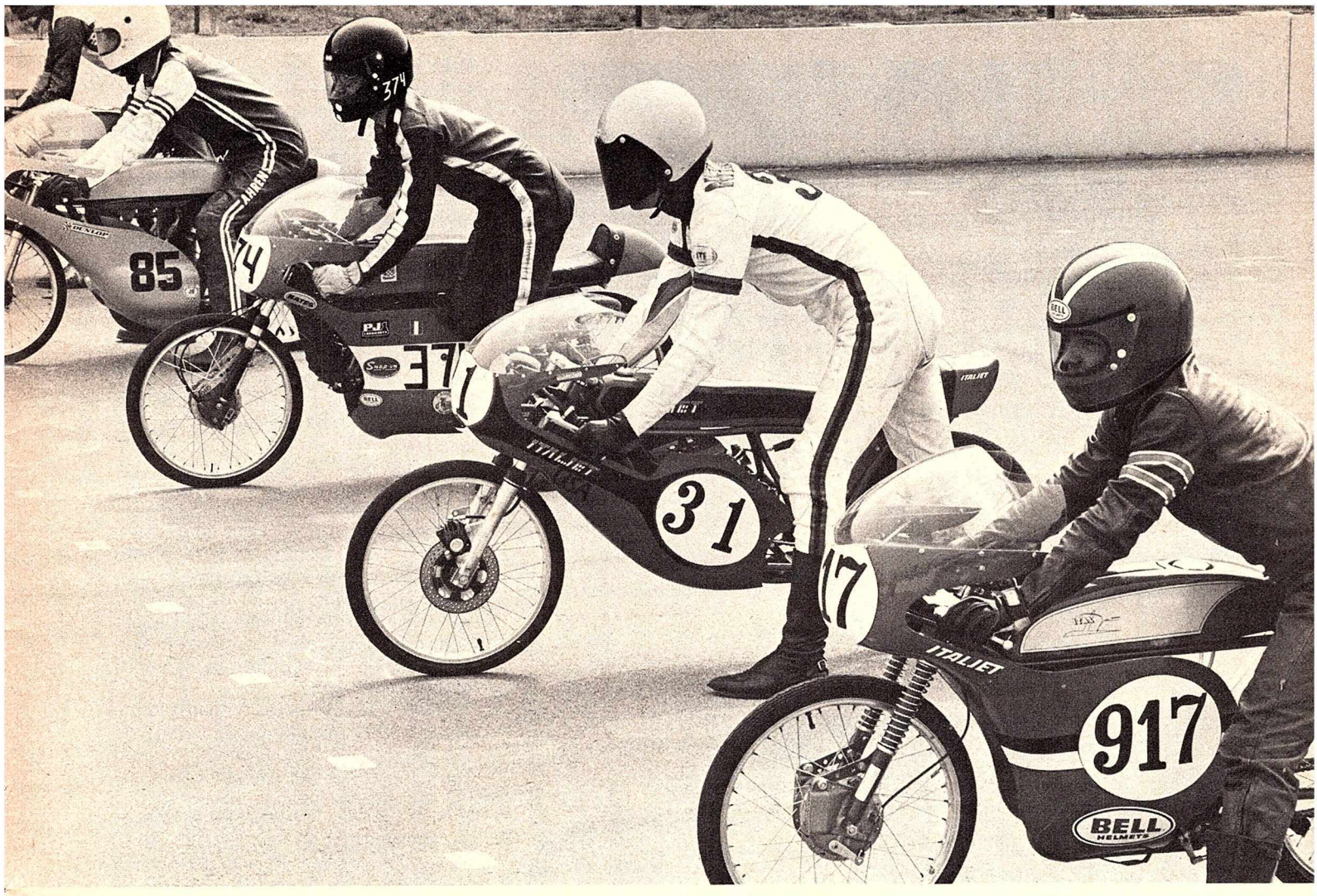
The roseate rapier is all essence: none of your power-consuming auxiliaries like tachometers and cables or anything extraneous to the bike's Reason for Being—swift flight from here to there and back again. All artifice had been swept away by the designer's monomaniacal thrust towards purity untrammeled, towards that perfect mechanical bell-like chord which when struck resonates down the corridors of history like a fresh strong breeze, turning to insignificance all that has blown through before.

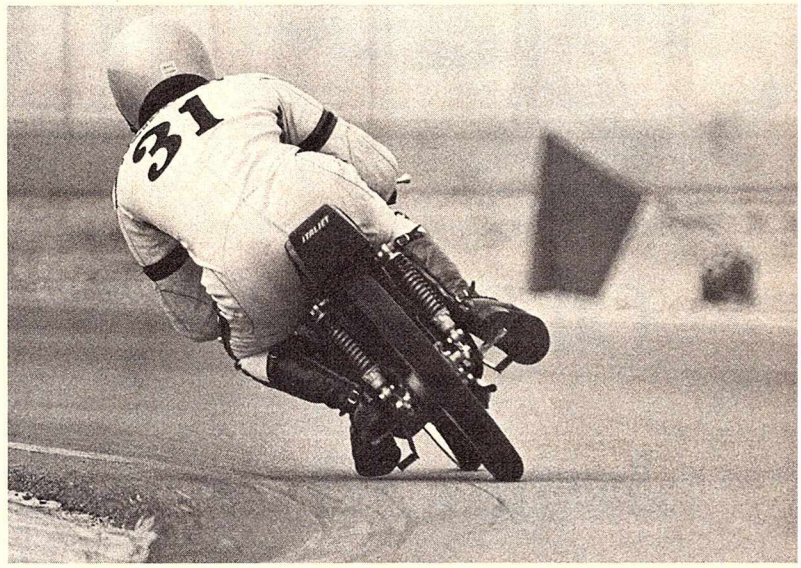
"Are you ready for practice?" Caldato asked. The flame flickered brighter in the combustion chamber of my heart. The moment had come. So nervous that I tore a glove as my fevered fingers tried clumsily to draw it on, I stood by as Mario led Number 31 through the garage door and into Ontario's gloomy vastness. Engaging low gear, he pushed authoritatively and lept aboard, the bellicose buzz-bomb hesitating, then, as if in anticipation of what was to come, snapping to life in a cacaphony of birdlike roars that soon had a crowd a-building and holding its ear. Mario expertly worked the throttle, warming the ever-angrier engine until it was at full pique, rending the air with the ferocity of its strident falsetto war-whoop.

I clambered aboard. Mario, to my right, gestured, "down for first." I nudged the tiny shift lever in the requisite southerly direction and eased out the clutch, rocketing out-of-controlledly through the bore of Ontario's tunnel and onto the track.

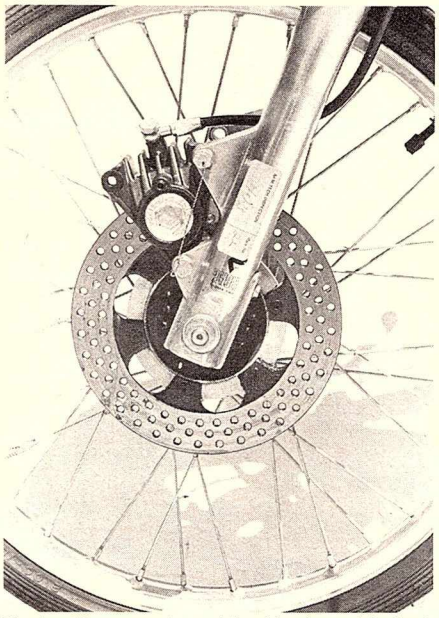
We were using the National course today. Running in a counter-clockwise direction, there were 19 numbered corners. Luckily, I was familiar with the track; all I had to do was acquaint myself with the ItalJet's interpretation of it.

I nurse the now-sulking dawn-hued dive bomber down towards Turn One. It is unhappy because its engine speed is down, yet I hesitate to inflict upon myself the punishing, powerful surge which must come when the bike achieves its operating range. Wait! Was that it? Yes! Gosh! We were actually in The Power Band, as strong and vibrant and alive and breathtaking as Les Brown's Band, or even Lawrence Welk's! The lumbar compression made my eyeballs sink backwards in their sockets; the strain of

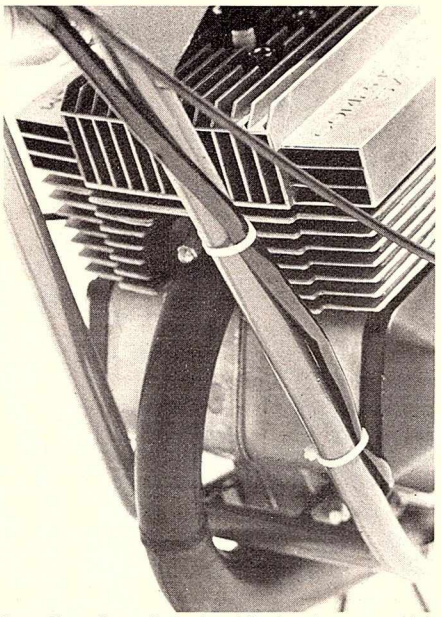




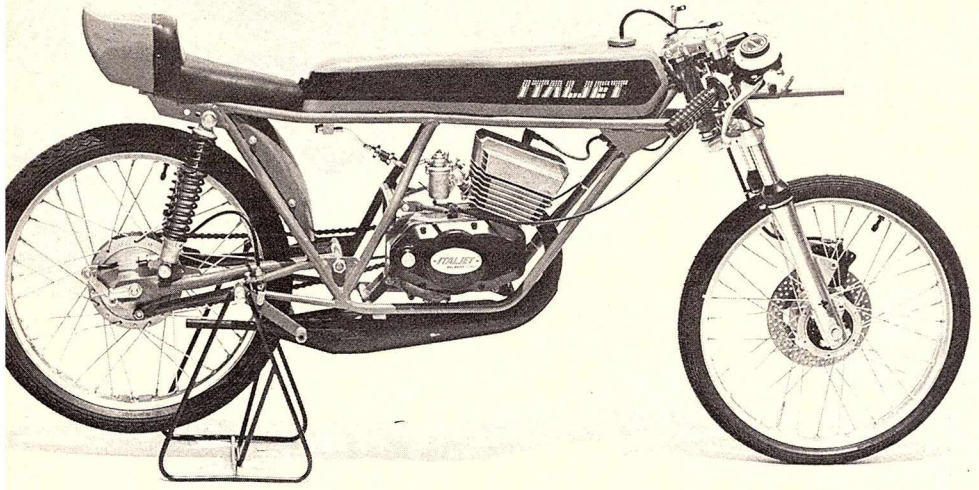
Poised amidst a caterwauling throng of thundering competitors, your Faithful Correspondent (31) prepares to launch his mellifluous missle into combat (top). Said launch had been preceeded by much peering and prodding; he knows the engine's in there somewhere, but where? Bring the microscope (left)! Finally embracing the tan-hot heat of competition, Your Correspondent flings his ItalJet to the absolute limits of cornering traction (above) and prays for luck. His prayers were answered.



The horrific momentum of the blood-toned bullet is faithfully arrested by this tiny hydraulic disc brake.

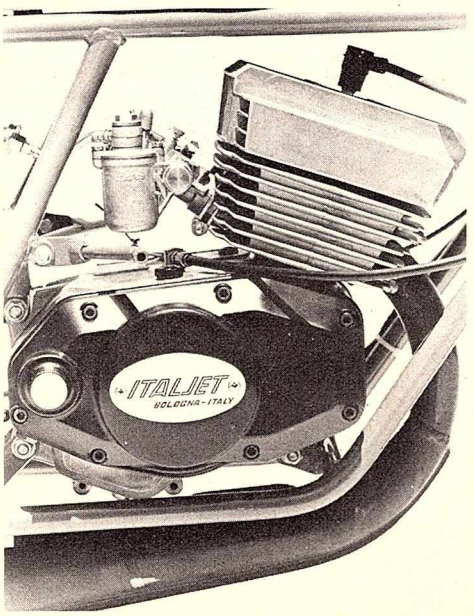


Ram-Air replica cylinder head finning does a good job of dissipating heat produced by the 3-cube engine.



Were Leonardo to design a motorcycle, it would doubtless resemble the ItalJet. It may be small—but it's pretty.

Off To War On An ItalJet 50



For $1300 you can own an ItalJet. Telephone 213-982-2000. Ask for Keith Mullins. And gas it up!

holding on to the clip-ons had the veins and tendons in my arms standing in bas relief and screaming in agony as they sought to control the otherworldly force that, in horsepower terms, must be bumping against double figures, or more.

Turn One was hurtling towards us now, and I applied the brakes and commenced downshifting. The ruby rocket slowed as if it had suddenly run into hip-deep chewing gum, and I flicked it towards the apex, tires shuddering in quest of traction, left toe burning from friction heat. With a pained yelp reverberating around the otherwise empty confines of my Bell helmet I scooted the toasty digit atop the peg and opened the throttle, the little bike leaping with a will of its own towards Turns 2 and 3. I notice that the chirping cherry minichariot is doing wondrous things to the track, both compressing and extending it. The number of turns is reduced; the length of the straightaways is expanded until they resemble the Oklahoma Turnpike, reaching into the far distance and seeming in their incomprehensible length to follow the curvature of the earth and disappear into pin-points somewhere near New Mexico.

The first practice session ends; in the second, whilst fanning upwards through the gearbox on the straight between Turns 8 and 9, a blur appears beside my foot and streaks ahead and out of sight. It is the Arch-Rival. It is Bob Nolan aboard his devilishly rapid Pancho-Villa 50, a bike/rider combination alleged to be able to run with some of the 100cc racers and even the 200cc production bikes! The Villa is water-cooled and seems to be 10 to 15 mph faster than my own. Nolan, a wily veteran of the SoCal GP racing wars, usually wins the coveted 50cc class laurels. Today, Mr. Nolan, I vowed silently to myself above the frightful din and vibration of the ItalJet, today the tables just might be turned; your uppance has come, or I'll know the reason why.

Back in the pits Mario Caldato, Sr. ministered to the wants and needs of my bike and the somewhat older ItalJets ridden by Mario, Jr. and Rudy Galindo. Ours was a team to be wary of; there was so much strength here that any discussions of strategy were unnecessary, and we all waited eyes a-kimbo for our race to come.

It was to be a run-and-bump start: not my favorite, my left leg not the member it used to be due to the Boer bullet still buried close—too close to operate—to the pectoral artery. I have, if you must know, a game leg, but I gamely vowed to give it my all. We waited for the starter to twitch his green flag; as soon as he did I pushed furiously and, with a clumsy effort reminiscent of Kate Smith climbing a fence, jumped aboard and let fly the clutch. The warbling warrior caught, bogged, caught again, bogged again, emitted a long, yearning, sorrowful *wwwwuuuuuunnnnngggggkkkkbbll* and finally, what seemed minutes later, brought itself up to full

squeak and we were away, far in arrears. Drat, I cursed to myself, I've blown the start. Nothing could be done save set the jaw a little firmer, clench the teeth with increased resolve and vow to go in deeper and come out harder. The bikes in front—and there were 30 of them, at minimum—would feel the hot breath of my dragoon before the day was done.

After two laps we have maneuvered up amongst the opposition, the red racer diving and darting, rocking and rolling, me holding on for dear life as the ItalJet overpowered bike after bike, subsisting on a will of its own, feeding on the dying carcasses of now a Honda 125 Enduro, now a Yamaha 80, now a Suzuki 50. I was looking for Nolan with blood in my eye. Despite the fact that his typical lap time was 12 seconds faster than my own I felt sure the ItalJet was, in the heat of competition, capable of performing beyond any reasonable expectation. And there Nolan was, right in front of me! So soon? Something was amiss! Nolan, doubtless feeling the pressure of my ItalJet, which was a mere 40 seconds behind, had gone all reckless and crashed! The day, if I could control my frenzied, tempestuous mount for a few laps longer, was mine. Slacking the pace from 2:44s back to 2:45s to give that extra margin of safety, the laps unwound. I saw the white flag and, in barely more time than it takes to read and memorize Cycle World, the checkers. With the crowd beside himself with excitement I partook of a victory lap, garlands of roses soaring out of the grandstands and landing in the path of a now-satiated ItalJet. Back in the pits, bedlam held sway. Water flowed like water. The trophy girl was attacked in the time-honored Ascot manner. The band struck up the Battle Hymn of the Republic, and the Mormon Tabernacle Choir, flown here especially by the ItalJet Director, swung into a stirring rendition of "Russets and Flourishes."

....Time Passes....

The track is empty now, Ken Roberts, Giacomo Agostini, Barry Sheene and Steve Baker the last to proffer their congratulations as they climbed into Sheene's borrowed Rolls Royce and ticked quietly through the security gate. Probably off to raise some hell, I thought to myself. I had been invited along, of course, but my leg was acting up. Besides, my mind was still on the ItalJet. We had gotten on well together, working with a harmony that comes from both brilliant design and—I admit—hard-won experience. As I stuffed my leathers and helmet into my helmet-and-leathers bag I glanced into the now-dark bay where, only hours before, the full force of the ItalJet racing team had been housed, shreds of packing material the only evidence that they had been there at all. Racing is peculiar business, I thought silently. Then I started my truck and headed for the sunset, and home. ◉

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RACER ROAD..... *Continued from page 39*

events, so it was variously entered in Four-Stroke GP, Super Café and Superstreet. It won all of its locals except one. Pridmore brought his BMW to a Riverside race preparatory to the Loudon National, and thrashed the Ducati fair and square when we tried to milk another race out of our Daytona rear slick. My fastest lap that day was 1:37.4. Pridmore had lots of 1:35s, and one I:34. We were desolated. We couldn't believe that the time differential was due completely to a worn-out rear tire. We suspected that the improvements Helmut Kern had made to Reg's BMW had created a performance gap we could not hope to overcome.

The improvements reflected suspicions we had had about the BMWs at Daytona. Since we had shared their garage during Speed Week we were privvy to certain information not widely circulated. We knew, for example, that at least one of the team BMs was not responsive to jetting changes. Plugs which looked gray and dangerous looked the same even after main jet size had been bumped from 170 to 190. We had passed this along to Gordon Jennings, our Technical Editor.

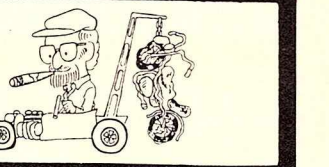
"Are their carburetors bolted directly to the heads?" Gordon had inquired. "Yes," we said. "With aluminum manifolds."

"That'll do it," Jennings said.

We also noticed that the bikes continued to be hard to start, were throughout the week difficult to time, and demanded tiny spark plug gaps—like .014-inch on the bottom plugs and .018-inch on the tops. Spark plug gaps less than .020-inch suggested to us that their ignition coils were weak, and when one of the team helpers was dispatched to search Daytona for K-Mart coils, it appeared that their diagnosis matched ours. The BMWs were fast at Daytona. They were also unhappy.

When Helmut showed up for the pre-Loudon Riverside event, we could see the improvements he had made. Carburetors were mounted on flexible rubber hoses. There were four automotive Bosch racing coils under the fuel tank. The bike started easily and with an old R27 advancer mechanism, idled peacefully. We also discovered that the crankshaft in Rego's bike had been rebalanced since Daytona, to reduce the kind of vibration that had been confusing the carburetors. After Reg disappeared up the track and left me for dead, Phil and I suspected that all those astonishing BMW technical specifications (compression, cam timing and lift, ignition, valve sizes, cranking pressure, etc.) had finally come out of the closet. We feared the Ducati would never again be competitive with the Butler & Smith bikes. We were wrong, as the October Riverside National would demonstrate.

Still, after getting thrashed so thoroughly by Pridmore at that May AFM race, we felt trapped. We couldn't do anything with camshafts. No cam grinder in the



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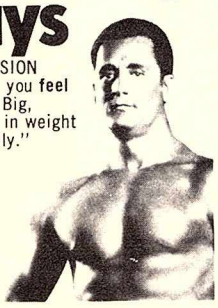

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United States will touch a desmo with a ten-foot pole, and while we knew the factory had cams with more lift and duration, we couldn't get them. We couldn't fit a larger inlet valve, because the valves nearly touched on overlap with the valve sizes we already had. We asked Venolia for pistons with more compression right after the May AFM race, but they told us they had run out of the proper-sized forgings and couldn't get more. It made no sense to increase carburetor bore size, because Branch had already determined that inlet valve size was responsible for the restriction, and the 40mm Dell'Ortos were plenty big enough. All we could do for Laguna was take weight off the motorcycle, and this we did with a vengeance.

We asked Elliott Morris for a pair of his magnesium wheels; when they arrived we decided to run them tubeless. And Pierre DesRoches, a young California artisan who was helping to prepare a Z-1 for Keith Code, began surreptitiously to duplicate some of the Ducati's components in exotic metal. Front wheel spacers changed from steel to aluminum, as did rear wheel adjusters. The rear caliper mounting plate was transformed overnight from aluminum to magnesium, and the Lockheed aluminum rear caliper was replaced by a magnesium Fontana item that Harry Hunt was importing. These, and a host of other small changes which propriety and guilt forbid me from discussing, slowly stripped weight from the Ducati. A stock Super Sport with a half-tank of fuel weighs 465 pounds; our race bike, after a trimming session that lasted from early June to late July, weighed 398 pounds, likewise with a half-tank of gas.

While we were doing all this to get ready for the Laguna Seca National, the all-conquering BMW team headed for Loudon—where they all got conquered by Mike Baldwin on Reno Leoni's Moto Guzzi 850 Le Mans. We were not surprised. Loudon is Baldwin's home track. Beyond that Baldwin is an especially talented young rider, and after dispatching the BMWs in the preliminary heat he simply motored around them in the Main, leaving Pridmore and Fisher to quarrel over second while McLaughlin headed for the pits with a multitude of mechanical problems. The BMWs suffered ground clearance problems and brake fade problems on the banked Loudon track, and by the time the Butler & Smith people got to Laguna Seca they were good and damned mad.

We didn't need that. Laguna has been a difficult track for me and the Ducati since the first AMA National ever held there. I crashed in practice in 1973, finished fifth in 1974 when a condenser went bad, and crashed in practice in 1975. While we were pleased to win the Heat in '76, the Ducati's transmission began acting up on the first lap of the Main, refusing to stay in fourth gear while I was pursuing Gary Fisher and Keith Code. Every time I looked up it seemed as if another BM was going past. With Fisher in the lead, Pridmore closing on him, McLaughlin on the ground in Turn Nine and Keith's Z-1 drawing farther and farther away from me, I parked on Lap 14.

"It won't stay in fourth," I said to Phil. He reflexively began fiddling with the shift-lever as I removed my helmet and listened to Pridmore's BMW thundering up the front straight, now in the lead and 17 seconds in front of Code. Fisher had dropped out with a fractured oil cooler. "Damn BMWs," Phil and I muttered to each other. "Damn Laguna."

What little joy we got from that place came not during the race weekend, but 10 days before, during a practice session/press conference arranged by Trippe-Cox, the promoters. Steve Baker was on hand, as were Pridmore and Kern, Code and DesRoches, Nixon and Kanemoto, and Ken Roberts. Roberts was in street clothes. "How 'bout lettin' me ride that Dew-Katty?" Ken had inquired, half-seriously. "Step right this way," we answered, whole-seriously. Roberts dived inside my leathers and borrowed Baker's helmet, and The Best Road Racer in the World moved the Ducati smartly onto the track. His business associate and friend Jim Odom had the clocks working. His lap times went from 1:26 to 1:24 to 1:22 to 1:20, and then he pulled in.

Schilling and I were anxious as old maids. What was he going to say? Whatever it was, we were prepared to accept it. A lousy old street clunker? Just so, Mr. Roberts. Slower than a moped? Suspected it ourselves, Mr. Roberts. Handles funny? Easy to believe, Mr. Roberts. You give a painting to Wyeth, a nag to Shoemaker or a photograph to Steichen and your option to dispute unattractive findings withers before their proven expertise. If the Ducati, subjected to molecular examination by a man we consider to be the most gifted motorcyclist in history, turned rank, sullen and slow, then rank, sullen and slow is what it must have been all along, and we never noticed. So in exchange for the honor of having Roberts ride a bike which Phil and I had developed, assembled and massaged, we took the chance of discovering warts on its character which we never suspected were there.

"Hey, it's really nice!" Roberts said after he took off his helmet. Information flowed out of him as he got down to specifics. "The back brake doesn't work at all. The front end's too stiff, and it has too much geometry. The back end's too stiff too, and you're using too much tire back there.

"But the motor's really nice. I didn't have any idea these Production bikes made that much power. Hey, it's fast. Betcha I could run 1:14s on this track with it."

Roberts' approval of at least the Ducati's engine was all we had as we drove down from Laguna ten days later with a four-speed Duck in the van and a big fat DNF on the record-book.

"Doctor T's picture!" Schilling hollered as we drove south past San Luis Obispo. "We forgot Dr. T's picture!" Dr. T is Dr. Taglioni, Ducati's main man, designer of the V-twin engine and responsible for two decades of Ducati engines and racing projects. Phil has a picture of him, standing track-side somewhere in Europe with dark glasses and a stop-watch. The picture goes with us to every National. We had forgotten to bring it to Laguna. Schilling didn't think it mattered that all the fourth gear engaging dogs had rounded off because I had indulged in a little shifting without the clutch. Nor did he recognize any connection between a season of gearbox problems and this most untimely failure. We had forgotten Dr. T's picture, and that explained everything.

Although two months intervened between Laguna and the final Riverside National, we kept the Ducati in the shop and away from race tracks. In the first place we wanted to preserve what life remained in some of the Super Sport's difficult-to-replace components—like its crankshaft. In the second we had no transmission at all, the post-Laguna Magnaflux session having consigned all the gears and shafts to the scrap pile.

And then, lovingly packaged, there arrived from Italy a factory close-ratio racing transmission which Schilling had ordered back in May and which had cost him $750. The parts were inspected, exclaimed over, checked with a file for hardness and taken post-haste to Bob Gorsuch for Magnafluxing, hard-chroming and Ever-Lubing. We were on our way. Except that when the gears returned, nothing fit. Not because of the hard-chroming (which Gorsuch removed from certain gear interiors and shafts); these-a were-a racing-a transmissioni parts-a, designed to be hand-fit. Schilling set to work in a haze of Dremel-dust and 40 hours later, pieces spun, meshed, engaged and slid as God and Dr. T intended.

That left us with only the piston problem to solve. In desperation I called ForgedTrue, who promised to deliver. Four days before the Riverside race they did.

There had been scheduled two pre-weekend practice sessions: one was sponsored by Boge/Mulholland on an invitational basis, and local racer Harry Klinzmann's father sponsored the other. We missed 'em both. The BMW team didn't, and neither did the Kawasaki folks. We consoled ourselves by remembering the importance of hoarding component life, and by assuming that I knew my way around the Riverside track. But we knew that both the remembrance and the assumption were on the thin side.

Still, we were pumped after the race weekend's first official practice session. Using one of John Smith's new D1750 Goodyear rear slicks, the Ducati was clocked at 1:34.4. The bike was handling well, the engine was running crisply, and we finished second to Pridmore in Saturday's preliminary heat, assuring ourselves a front-row grid position for the 16-lap Production Final.

Goodyear had been smoked by Dunlop at Laguna Seca, part of the problem arising from a strike that had lasted all summer in Akron. Dunlop had been able to continue tire development; Goodyear had not. By Riverside, most of the fast TZ-750 Yamahas ran on either Dunlops or Michelins, leaving John Smith with a garage full of new Goodies and precious few customers. Just before departing the track Saturday, I remembered something that Fritz Huebner told me two years ago when he was still working for Kel Carruthers: "Tires are just like premix; you use them once and throw them away." Nothing sticks like a fresh slick. Smitty had a pile of D1750s that nobody seemed to want. The D1750 on my Duck had 15 laps of wear. A fresh one might be just the trick for Sunday's Final. "Sure thing," Smitty said, throwing a crispy Goodie in the back of our van. Counting the 1381A we had arrived with and the new D1750 we installed Saturday evening, the Duck had worn three new rear tires in a single day, which strikes me as being a fine display of big-time decadence.

If you read last month's issue you already know that the Duck finished second in the Final, behind Pridmore and ahead of McLaughlin, Fisher, Wes Cooley and Mike Parriott. You may have noted in the story a reference to oil coming out of the Ducati's breather.

Two points here: the first is that my problem had little to do with Rego's Superbike victory. He beat me at Daytona, he beat everybody at Laguna, and he goes better at Riverside than any other track. I had one lap in the 1:33-second area, and 12 laps at 1:34. Pridmore had at least three 1:33s. Second, the engine as it turned out had every reason in the world to squirt some oil out of the breather. What was ultimately surprising is that it did not squirt connecting rods, pistons, gear parts and camshafts from the same orifice. On or about lap 12 of the 16-lapper, one the rear piston's wrist-pin retainers had fractured. A chunk of retainer material had pierced the bottom two rings in at least two places each, then cocked the piston in the bore, taking out the small-end bushing and the big-end roller bearing assemblies of both rods. There were trenches in the rear cylinder liner that measured .060-inch deep, and the slurry which resulted from all this mashing-around contaminated the Duck's oil supply and ruined the rest of the engine's bearings, cam drive gears and transmission. Schilling's $750 gearbox was a write-off (note here how I clearly establish those mangled transmission parts as *Schilling*'s transmission parts). Counting labor, we figure Riverside cost us both about $300 per lap, a lost sum which second-place prize money did little to restore.

"Ah," as they say, "but that's racing." And so it is. The way the Ducati had leapt away from Turn Nine on the last lap and pounced on McLaughlin's BMW for second was worth millions to me. Besides, as Phil's former mentor Bob Oakes was fond of saying, "You put that thing on the starting line, Andy, it ain't worth nothin'." How true, how true. Nothin' is what it was worth after Riverside, and Phil and I both have a long and expensive winter ahead of us.

Long and expensive winters seem to be integral factors in the racing equation. Information secured merely uncovers questions unanswered; sources unearthed lead to sources untapped; money spent discloses ever more burdensome financial imperatives.

Yet it's been worth it. The Ducati's Daytona trap speeds had both of us giggling for months in the sheerest delight. Its third-place finish there and its second at Riverside in no way added up to a win, yet we were proud of both. The Ducati's solitary 1:33-second lap at Riverside and its 2:17.6 at Daytona reflected my own development as a rider, and Phil's as a tuner. The bike finished every race it started but one, and over the past three seasons has finished every race except two. We've learned much from racing: to ferret out the best advice we can find and follow it unquestioningly, however unpalatable it may be. This we learned from Bob Gorsuch, our Magnafluxer, whose inspections of Ducati gears constituted more unpalatable good advice than we felt we could bear, but whose efforts had much to do with the Duck's ability to drag its maimed internals around Riverside for the final four laps when its engine should have exploded instead. We have had another season to explore first-hand the character and resolve Dr. Taglioni built into the Ducati Super Sport five years ago, and we found ourselves regularly astonished at the degree to which the passage of time has reaffirmed the man's genius and his very clear distinction between what's right and what's expedient.

We've both learned much about racing's inherently bitchy character, and understand more clearly why it is the way it is: folks get on a track and try to beat each other at a dangerous game, it's gonna be bitchy. We've disciplined ourselves to segregate more accurately the *real* from the *hoped-for*. Nothing divides the two more emphatically than racing, yet we have discovered racing to be a haven for the mythic masquerade. We have learned that *if-onlies* don't count; worse than that they impinge insidiously on the perception of useful truths.

We have come to accept the special tyranny of the stop watch.

And we have both learned that racing provides its own final reality: the posted list of finishers, first through last. The point is to move up the list. This is the only point. ◉

KAWASAKI 1000 ... *Continued from page 33*

the hope that voluntary compliance in advance of demand will placate the EPA. That's a hope that exists perpendicular to everything we have come to know about government agencies, but all the bike-maker biggies share it and are acting accordingly, and that's that.

People who bought very late 1976 KZ900s got bikes with KZ1000 chassis, which look much like that of the original Z-1, but are very, very different. As everyone who has ridden a Z-1 hard surely knows, its handling really wasn't up to the standard of excellence established by its engine. That hasn't changed, though you can't fault Kawasaki for not trying. They nudged the steering-head back slightly and lengthened the swing arm, which has increased the wheel-base from 58.7- to 59.3-inches and shifted the bike's center of gravity forward. They have also gone to stiffer fork springs, with less preload, and revised the fork damping very considerably, along with lengthening the fork sliders. Those with a sharp eye for detail will also note that the area of the frame around the steering-head now has more extensive gusseting, and one of our contacts at Kawasaki says he *thinks* some of the frame tubes' wall-thickness has been increased. And, finally, the swing arm pivot bearings were changed—the old vanishing-act bushings have been replaced with needle-roller bearings. This is a much-needed, long-awaited improvement and if it doesn't do anything for a new KZ1000's handling it will at least make it a lot better at the 10,000-mile mark.

Another item that should do something nice for the KZ1000's reliability is its chain, which is made by Enuma and has small O-rings sealing between the pins and bushings. There is a supply of grease packed into the pin/bushing gap when the chain is made, and retained there by the O-rings, so it's a little less sensitive to maintenance schedules than conventional chain. Owners will have to keep dribbling a small quantity of oil along the edges of the chain's rollers, and the sheer amount of horsepower a big Kawasaki's chain has to transmit will continue to keep its service life relatively short, but the new chain does promise to be better. As a matter of fact, any relief will be appreciated, because replacement chains are expensive, and they're a complete pain in the knee to fit as there's no master link and you have to dismantle everything from the swing arm pivot rearward to switch chains. Incidentally, this new chain has the same number of pitches as the one it replaces even though the KZ1000's rear drive sprocket has two fewer teeth than the 35-toother fitted on the Z-1; the slack is taken up by the longer swing arm.

You get new and—on balance—better brakes with the KZ1000. Our test riders were split about evenly in expressing enthusiasm and distaste for the rear disc brake, which replaces the old 200mm drum. Nobody had any reservations about the rear brake's effectiveness; a double-piston caliper pinching a disc that large (250mm effective diameter) just won't take no for an answer. The rear brake's problem is that it is, for some riders, too sensitive. The good news is that the rear brake never fades; the relationship between pedal pressure and braking force never changes. And the brake has a very solid feel, devoid of the sponginess that is the curse of most floating, single-piston calipers.

Would that the KZ1000 had a front brake equal to the one Kawasaki has added at its rear wheel; it doesn't. There's a new front disc, and caliper, but the latter has a single piston, a floating mount, and flexes so much you can see the caliper's halves springing apart when the handlebar lever is squeezed hard. The only thing that saves this brake is that the piston diameter has been increased to 42.9mm, up from 38.2mm, for a roughly 26-percent increase in area, which has lowered the working pressures enough to keep the caliper flexing within acceptable limits. The front brake pads have been reduced in size, and seem to be made of a softer, high-friction material that doesn't take as much pressure to produce a given level of stopping force. The net result of these front brake changes is to reduce the force required at the lever, and to create a somewhat closer-to-linear relationship between squeeze and stop. We wish Kawasaki had fitted the big twin-piston rear caliper at the KZ1000's front wheel and put the front caliper back at the lightly-worked rear disc; what they have provided is . . . adequate.

The older Kawasaki Z-1 did, occasionally, have some problems with its alternator. Riders who used a lot of engine revs sometimes found that the alternator rotor's magnets were yielding to centrifugal force, and moving outward to contact the stator. The KZ1000 has a new alternator, with more output and a new rotor, and it even has fins on its voltage regulator. We expect that the magnets will now stay in place; we're still not completely thrilled with the charging system. Without going into all the circuitry, diode by diode, we'll just say that the permanent-field alternator's output isn't really regulated, it's only diverted, and that there's no control over current other than that you find inherent in alternators. The voltage regulator controls voltage, sort of, but if you leave your KZ1000 parked for a while and its battery gets a tad flat, then the charge-rate is going to be right out of sight when you start it again. On the other hand, nearly all motorcycle charging systems are at the stone-age level, compared with what you find in cars; the one provided with the KZ1000 can be rated high-average for bikes, with an only slightly greater than average tendency to assassinate its own battery.

Sporting riders always could *know*, in detail, everything that was wrong with the old Z-1 and still enjoy to the point of an almost sexual rapture what the bike was capable of doing on the road. The same is true of the KZ1000, which has fewer wrongs to dilute the rapture. One enormous improvement is in the seat. The Z-1's hard, high-crowned perch kept us wondering if maybe the Japanese weren't trying to get even with us for having sent Admiral Perry to blow their walls down in 1860. If so, the retribution taken was all out of proportion, like the seat itself—which might have been designed by someone who'd never seen a human backside. But that's all behind us (so to speak) now, as the KZ1000 has a very nice saddle, with a hair too much forward slope. The seat is broad, flat from side to side, and has padding that's the right density. The comfort-factor also gains from the KZ1000's seat-handlebar grip-footpeg relationship, and the control layout. We use bikes' tripmeters as fuel gauges, and love the Kawasaki's reset wheel, which can be used to zero the tripmeter even if you're wearing mittens.

It was easy for us to know when our test KZ1000 was going to need fuel: it almost always needed fuel. We are assured that riders for Kawasaki's Technical Services department can get nearly 50 miles per gallon out of the big KayZee; we see in other magazines' reports fuel economy in the mid-40 mpg range; we seemed to be mired in the mid-thirties, and targets of accusations to the effect that we'd been road racing the KZ1000. Maybe there's a grain of truth in that, as all our test riders much prefer mountain roads to droning along freeways. But our feeling is that a sporting motorcycle should be tested in a sporting manner, and we really don't care terribly about fuel economy as long as a bike has a tank big enough to give it decent range. Although the specifications say you get a smaller fuel capacity with the KZ1000 than the Z-1, 4.4 gallons compared with 4.7 claimed for the other model, the new tank—though identical externally—hugs the frame a bit tighter and actually holds an even 4.5 gallons, whereas the old one wouldn't yield up much more than an even four unless you wrung it out like a rag. You can go about 150 miles on a KZ1000 before running the tank dry, hammering it frightfully hard, and that's the only mileage worth worrying about. Ride the bike so fiercely that you only get 35 mpg and that's still only costing you about two cents per mile; nurse it along like a deacon, pull 45 mpg, and it's a half-cent per mile cheaper. We'll pay the extra half-cent, and take the entertainment.

Kawasaki's KZ1000 retains the Z-1's ability to entertain, while dropping some of the old bike's bad habits. We've already mentioned their replacement of the vinyl crucifix, that old high-crown seat; they've also done a lot with the bike's ride quality.

The inch-and-a-half longer fork sliders seem to work with less stiction, and the bike is much smoother-riding in its highway cruising mode than a Z-1 despite having fork springs 14.4-percent stiffer. The stiffer springs are shorter, however, and it's our hunch that their free length is such that they simply don't drive the fork out against its topping springs like the softer ones used in the Z-1. Some of the difference also may be in the suspension damping, which has been changed, and a little could even be in the suspension damping, which has been changed, and a little could even be in the volumes of fork oil specified—169cc for the Z-1, and 140cc for the KZ1000. Whatever they did to make the difference, it's there, and the KayZee can be used as a straight-road tourer by people who aren't masochists.

Riding sports will find that the KZ1000 is also pretty effective on mountain roads, as the brakes and chassis perform plenty good enough at a 75-percent exertion. The front brake is good enough to make the tire howl with a two-finger squeeze at the lever, the clutch is nicely light and smooth, the shifting is precise and light, and the bike feels right in the way it sits and responds. You can do business on it—at the 75-percent level, which is more than the average riding sport will attempt. But there are in the world genuine sporting riders, and they'll discover that it takes more than a lengthened swing arm to tame the big Kawasaki's handling. Push the KZ1000 vigorously around fast, sweeping turns and you'll get that familiar cornering wobble—undiminished, and seeming a bit worse just because it isn't hiding behind a thicket of wheel hop and tire shudder. Hook the bike into a decreasing-radius turn, using the brakes to rub off speed and tighten its arc, and you'll find that the front end, gusseting and all, still flexes.

Worst of all, the added weight and increased forward weight bias seem to have brought the Kawasaki's front tire much closer to the point of being overworked when the bike's in a cornering attitude. You can corner the KZ1000 very hard, and you can get it to brake really hard, but you dare not mix those activities unless you're prepared to be extremely careful with the proportions.

You'll also find that the KZ1000 tends to run wide in turns if they're taken on trailing throttle; it steadies considerably if you've got the power applied. We should also mention that the KZ1000 doesn't give away enough in-corner distance to any other motorcycle to matter much. The bike has plenty of cornering clearance with its new exhaust pipes, and if it isn't exactly a marvel of steadiness in fast turns it does get around them awfully fast. Besides, a few yards lost in corners doesn't amount to anything when you consider that the man on a KZ1000 can grab them all back, with interest, the instant the road straightens. You could do that with the Z-1, too, but only if you had the revs in hand; the KZ1000's midrange grunt is better than an automatic transmission, and better than downshifts in most motorcycles.

It's the improved midrange power, and a remarkable banishing of the Z-1's intrusive engine vibration, that combine with the seat, ride-quality and blessed lack of mechanical noise to make the KZ1000 a much better machine than it was. That old, mirror-blurring buzz has taken the jolting ride by the hand, and both have gone off into the sunset. Good riddance. The bigger engine hasn't given the bike better flat-out performance, but it pulls almost from idle, now, and begins to show a lot of bicep at only 3500 rpm. A thudding vibration, from lugging, will keep you from using much throttle below 3000 rpm but the engine is willing if you are—and can ignore the pinging you'll get burning no-lead fuel. Then, too, while the genuine sporting rider might wish for a steering geometry that would improve the KZ1000's fast cornering behavior, what is had does make the bike lighter-handling

(Continued on page 116)

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KAWASAKI 1000 ... *Continued from page 115*

when you're tooting around town. It doesn't feel like it weighs over a quarter-ton, which is good, because it does weigh 564 pounds with its tank brimming.

Another thing to like about the KZ1000 is it's styling. You can get it in a quiet red; our test bike was painted a subdued, slightly-metallic dark blue, with gold pinstripes. Kawasaki's big four has always been the King, and we're happy to see it dressed for the part. And the KayZee isn't just the King of motorcycles: our sister publication, Car and Driver, says a four-wheeled confection made by Ferrari currently is the world's fastest car. If the Ferrari and the KZ1000 left the starting line together at some drag strip, the Kawasaki rider would finish the acceleration contest a full *two seconds* sooner and more than $50,000 cheaper than the poor tea-bagger in the flashy Italian coupe.

In fact, we can't think of *anything* street-legal that's likely to survive a dragstrip shoot-out with a well-tuned KZ-1000. At least nothing off the ready-to-wear rack, and absolutely nothing with the Kawasaki's indifference to treatment. We hammered our test bike thoroughly, handed it over to *Cycle's* publisher for almost a week of slogging around in city traffic, then retrieved the Kawasaki and went straight to the dragstrip. There the ignition timing was nudged up a hair to get it right on specification and the rear tire pressure dropped to 20 psi, but there was no change in jetting or gearing or even the traffic-sooted spark plugs. And the KZ1000's very first pass through the quarter clocked at 12.11 seconds with a terminal speed of 110.97 miles per hour. Its second run was the day's fastest, at 12.06 sec. and 111.66 mph, after which it slowed slightly as the engine got the hots. But, except for a couple of missed-shift passes, the KZ1000 stayed below the 12.2 E.T. level and above 110 mph through the speed traps all the way. It was a bravura performance, and established the KZ1000 as *the* Superbike—even faster than the original Z-1, which was lighter, had bigger carbs and tighter gearing.

When you get right down to it, the KZ1000 may be a little like a Cadillac powered by a four-row radial Pratt and Whitney aircraft engine, and not the lightest or handiest vehicle in the whole wide world. But by gadfry you can't deny that it is *powered*, and then some. It's engine long ago established itself as being a marvel of muscle and longevity, and Kawasaki has succeded in making it even better for 1977, and improved the whole bike in terms of comfort even if truly good handling continues to elude them. Kawasaki may not even care all that much about the handling. They know, just like the rest of us, that riding one of their big fours means never having to be sorry there's not more power. That's not everything, of course, but it's enough to make the KZ1000 powerfully appealing. ◉

PIPELINE..... *Continued from page 18*

As a pertinent example of the road-to-track progression, Michelin delivered the S41-PZ. Carrying a road pattern first introduced nearly ten years ago, the PZ looked nothing like a racing tire, and in deflated condition had every appearance of having fallen off a vintage sidecar rig. Actually the inflated section was good and round, and the competition S41 made concession to racing with two special compounds known as PZ2 and PZ4; the softer 4 warmed quicker and was more suited to the wet. Identical in construction to the street-going S41, the racing PZ transmitted braking forces extremely well, dispersed heat build-up quickly, dealt with all conditions, and justified the "greatest all-round compromise tire" title.

Besides looking after the front ends of big-power 500 and 750 racers, PZs went on the back of the 250 and 350 Harley-Davidsons and Yamahas which dominated their classes, though 350cc duty was shared with slicks. The slick, fitted when weather conditions allowed, gave way to the S41-PZ during foul weather and whenever race authorities embargoed slicks. Thanks to a quaint piece of FIM reasoning, slicks were illegal for 250s, so the smaller H-Ds (Yams, Mobidellis, etc.) always ran treaded tires.

Dunlop stayed with traditional trigonics for 250cc racing, using either a combination of KR76 front and KR96 rear, or KR96s front and rear. Three-fifties could have slicks at both ends with 3.25/4.50 KR108s (front slicks on 750s) driving and 3.25/3.50 KR106s leading. When the patterned-front/rear-slick composition prevailed in the majority of cases, 3.00/3.25 KR96 fronts (trigonic rears originally) took precedence over KR76s because the more stable pattern absorbed the extra performance of the rear slicks. And if the weather and the FIM put the block on slicks for 350s, KR96s went on both ends.

The Great European Tire War could conceivably be seen as simplicity-versus-complexity. On one side, Dunlop took into account all the variables of temperatures and road conditions, and attempted to overcome every foreseeable contingency with a near-riot of types, shapes and rubber mixtures, finishing with a big range of tires which often differed in small detail one from another. In opposition, Michelin chose to compromise and rationalize, keeping types, compounds and patterns to the minimum. On 1976 evidence Michelin made the correct decisions. Simplicity conquered intricacy.

Michelin is preparing for 1977 action, expecting Dunlop to mount a renewed challenge. The word from Birmingham is that Dunlop is staying in the hunt with new slick and patterned tires ready to go. Which isn't saying that Michelin will return with exactly the same equipment that they offered in late 1976.

Let battle commence.

—Jim Greening

FRAME FIX ..... *Continued from page 48*

in place without disturbing the engine. In either case the welding must be done with great care, as you wouldn't want one of those three upper frame tubes to fracture, and it's easy to weaken a steel tube with welded brackets.

Add-on braces can't be used to stiffen the Z-1 frame's swing arm pivot attachments, as its engine sits squarely in the middle of the space that needs cross-bracing. So you do something that works about as well as adding tubes: you make the engine serve as a frame brace. The big Kawasaki's crank/transmission cases are very strong, and have four sturdy, widely spaced mounting lugs, all of which is very well suited to holding the two sides of the frame tightly in alignment. The engine is prevented from making this structural contribution almost entirely by the loose fit of its mounting bolts. And when you know that, the fix is obvious: you switch to bolts that are a tighter fit.

Actually, changing the Z-1's engine-mounting bolts is a bit of a chore, the worst part of which is finding the right kind of bolts. One problem to be faced, if you live somewhere out in the hinterlands, is obtaining high tensile strength bolts of any kind. And if you use ordinary mild-steel bolts you're going to discover that they soon stretch and loosen, and repeated tightening just makes them increasingly longer. Another difficulty is that you have to find four through-bolts of considerable length to replace the originals. All these must be slightly larger in diameter than those supplied by Kawasaki, and all the holes have to be drilled oversize to a diameter exactly matching the new bolts. This tight fit, and the fact that the stronger bolts won't stretch, will keep the Z-1's frame and engine tied together—and drastically reduce the amount of flexing in the frame.

There are other cautionary notes we must lay before you, not the least of which is that you should be prepared to do a lot of work and do a lot of chasing around before even thinking about embarking on the project outlined here. And you should be prepared for a let-down, which may come when the job is finished and you realize that what you've done is completely invisible—out of sight and beyond the appreciation of friends and neighbors. Finally, you should be warned that the improvement in handling can't be felt at anything near an ordinary touring pace. We think any rider who uses the Z-1's front brake hard will notice a greater steadiness when the triangulated top-tube bracing is installed, and upgrading the swing arm pivot bearings to KZ1000 standards will maintain a Z-1 at as-new straight-line stability levels for many more miles than you could expect from the old iron bushings. Those things are worth doing. The engine mounting bolt modification is worth knowing about, and a nice winter project for perfectionists. ◉

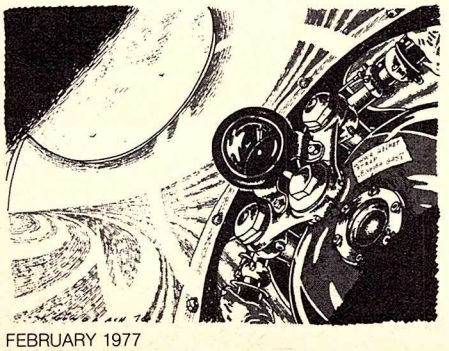
CAMBER ..... *Continued from page 101*

Like other good touring fairings, the Camber unit increases the utility of a motorcycle, if utility means greater use through greater convenience. Out on a short haul? You don't have to be dressed to battle the wind-chill factor. A motorcycle is more convenient when you can grab your helmet, ignore a bulky jacket, leave your dress trousers on, pull a pair of gloves out of a fairing compartment, hit the electric starter and depart for the newsstand. Many other times during the spring and fall a fairing eliminates or minimizes the normal motorcycle ritual of getting-ready and coming back. You can be a lot less sensitive to what you're wearing, even on a grey-cloudy day.

Contrary to the pop-music myth, sometimes it does rain in Southern California, and rain-riding is not our idea of fun. A sudden shower blew up out on Interstate Five, and in seconds the windscreen went opaque with raindrops. Soon thereafter you could see the Seventy-sixer knocking a hole in the weather and blowing the rain around the dead-air pocket. Happily the rain sputtered out instead of expanding into a genuine douser, so the Camber fairing held the inconvenience to nothing more than a damp jacket.

Riding inside the dead-air envelope of the Camber '76 suggests why touring buffs develop a never-ending emphasis on comfort and convenience. Sheltered from the air blast, your attention turns to other matters. Should the seat be uncomfortable then you'll notice it, and fast, because you don't have the wind slapping you around. Are the grips uncomfortable? You can't miss it. How are the legs? Could you use floorboards? One accessory leads to the next.

The Camber fairing is a stylish touring unit, well conceived and well executed. It provided comfort and protection without giving our 550 Honda a weight problem (18 pounds complete) or sacrificing its straightline stability or mucking up its handling. With few exceptions touring riders will like Camber's handiwork. And what about those hot-blooded sporting types who clench motorcycles with knees and elbows? They will have little use for the Seventy-sixer. No big problem. Camber can put the Harry Hotlaps behind a Yamaha TZ750 fairing—where there's little comfort and no place to hide. ◉



HERCULES 250 .... *Continued from page 69*

fed by a huge 36mm Bing carburetor which must be mounted at an angle for its cables to clear the upswept pipe. Carburetion was beautiful throughout 700 miles of testing, so function is not apparently effected by the tilt. Nevertheless Hercules is rerouting the pipe and reangling the cable retainers on top of the carburetor. They should also consider rubber-mounting the carb as they did on the 175, because the 250's solid mounting requires a socket and extention to loosen, thereby complicating trail-side jet changes. Without rubber to insulate the carburetor from vibration, metering can also be effected and slide wear excessive.

While racing the Husky on a Death Valley fire road, we were running the Hercules at wide-open throttle with only 94 miles on the odometer and the piston seized. That was our fault—we simply let out all the stops before proper break-in had occurred. Rotary Cycles air-freighted another barrel which turned out to be shaped just like that—a barrel. Piston clearance ranged from .004 on top to .008 in the middle and back to .004 on the bottom. It was a used cylinder—the iron liner had merely been honed. Since a subsequent new cylinder was round, we can only assume that the liner may not be thick enough to resist distorting.

After a new cylinder was installed and break-in extended to 200 miles, the engine survived a fast-paced 86-mile District 37 enduro and several torturous dyno runs without so much as a ping. Starting usually requires one or two kicks and can be achieved in any gear, another advantage over a Penton or Husky.

The drive-train is an impressive design with several exclusive features. Most important is the relationship between the swing-arm pivot point and the countershaft sprocket—very close—so in spite of long-travel suspension, not much chain slack is necessary. This eliminates elaborate tensioners and guides, which rarely control great amounts of chain slack with total success. The Hercules chain can be adjusted with only one inch of play. It is manufactured in Germany by Jwis and features extra-thick link plates.

Both the rear hub and clutch contain rubber cushes to insulate the transmission from shock loadings. The quick-change hub can be removed without disturbing the sprocket, brake-rod or chain. Tires aren't as easy to work with because the Akront alloy rims don't employ spikes to keep them from slipping. You'll have to wrestle with rim locks when fitting new knobs. The spokes require very little maintenance, mostly because they are straight-pull on the sprocket side.

An exclusive design in the clutch—L-shaped tangs on the plates—protect the basket from the usual notching. Satin clutch action and a wide friction point top off one of the finest drivelines in motorcycling.

Another bulletproof design is the use of tapered roller bearings at the swing-arm pivot. These sealed units are superior to bushings or needles and should never need replacement. Both the swing arm and frame are chrome moly steel. The bike's wet weight of 271 pounds is indicative of heavy-gauge steel, and lots of it. The resultant durability is why 23 of 25 Hercules entries finished the ISDT.

"Can I sit on it?" the onlookers ask. They squeeze the levers and pump the forks and prove whether they're street riders by how smoothly they lift it onto the centerstand. The stand is an option weighing less than two pounds and worth every cent of its $24 pricetag because of simpler wheel removal, chain lubrication, etc. The Hercules also comes with a sidestand.

Everybody likes the bike's feel. It sits right, it's not too tall and the Magura-equipped handlebar has a natural feeling. Both foot levers are shaped and positioned perfectly, but the pegs need sharper serrations for a better grip on boots. A thick saddle with soft but resilient foam doesn't keep inching the rider forward and doesn't sag in the middle.

Experiencing the Hercules at speed is what still leaves us enthusiastic in spite of the Big Four Problems and numerous niggles. The motorcycle steers beautifully. It will either slide or track through a turn, whichever you prefer. Metzeler tires, neutral geometry and excellent suspension damping make handling difficult to criticize. Stiff springs pummel the rider at slower speeds, but they add 6 or 7 mph to his potential speed on really rough trails. When the MR Hondas are strung out in fifth and gnashing at their suspension stops, the Hercules can catch another gear and start using full travel. A superb front brake keeps speed in check without losing its progression or feel when hot.

Power or its delivery cannot be faulted. The engine contributes greatly to the bike's steering abilities because it lifts the front end to clear obstacles and drifts the back end to set up tighter lines, all with a crack of the throttle or a poke at the shift lever—assuming you catch a gear instead of a neutral.

And that brings us to the only possible conclusion—a strong endorsement of the bike's potential and 95 percent of its actual performance, punctuated by a discouraging reminder of reality—missed shifts, vibration, brake hop and gas-guzzling. God, how we wish they weren't there. ◉

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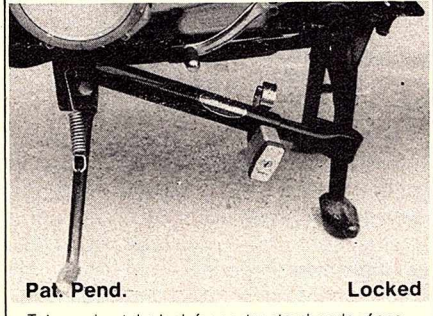

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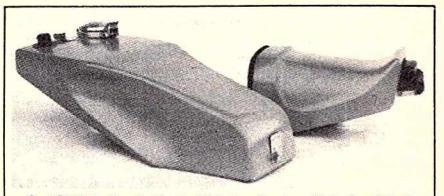

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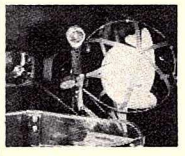

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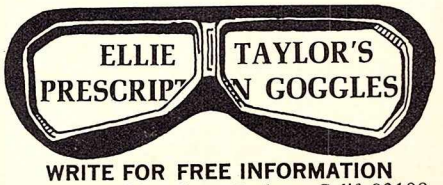

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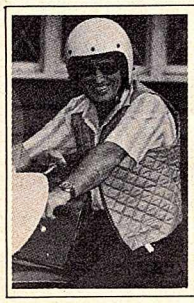

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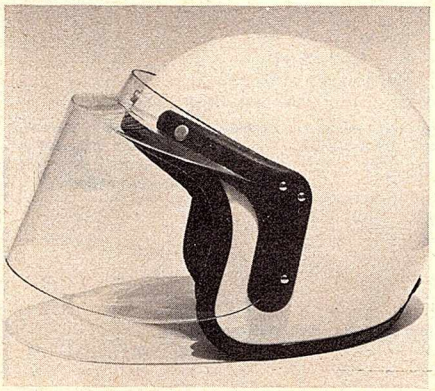
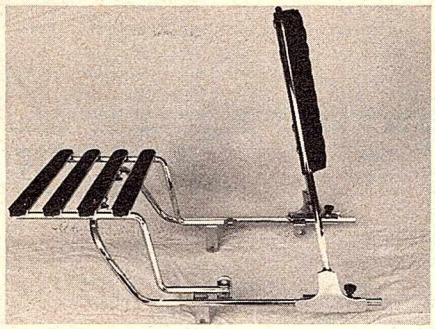
Wrap-Around Shield: Land Tool Company's newly designed faceshield for helmets offers some novel benefits for the street and touring rider. The wrap-around design of the shield helps to reduce fogging and gives the rider a lot of interior clearance. The convenient shield also



flips up out of the way. The optical-grade polycarbonate minimizes distortion. This shield meets VESC8 specifications. Information is available from Land Tool Company, 650 E. Gilbert Street, Wichita, KS 67211.

CIRCLE NO. 1 READERS SERVICE PAGE

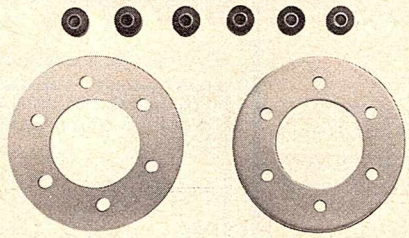
Luggage Rack/Backrest: The Slider backrest assembly uses an innovative approach; the design combines comfort and carrying features by building the backrest and luggage rack as a single unit. The backrest has 20 inches of adjustment on its own framework. The four-point attachment eliminates mounts on the fender or tail light. Thumb-screws fix backrest ad-



justment; the screws are nylon-tipped to prevent marring the finish. Basic construction is 9/16-inch steel rod and the metal is chrome plated. The luggage rack is finished in mahogany. Retail price is $99.99 from your dealer or you may order from Dougdann, Inc., 6444 17th Ave. S, Minneapolis MN 55423.

CIRCLE NO. 2 READERS SERVICE PAGE

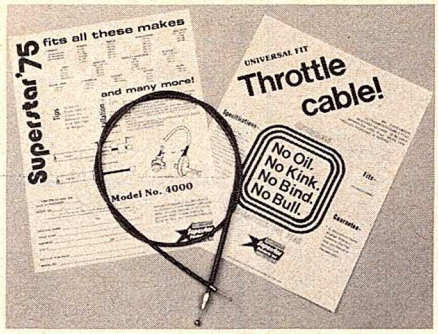
Mag Wheel Shock Cushion Kit: Circle Industries has developed a valuable item to reduce shock loads on alloy racing wheels. Circle's rubber shock cushion kit uses elastic-bushed plates to absorb the sharp impact loads. The shock kit is intended to limit metal fatigue and prevent cracking of rear racing wheels. It should



also reduce engine and driveline shocks that can damage transmissions. Circle has kits for Morris magnesium wheels and other special racing hubs. $13.95 covers the price. The address of Circle Industries is: 17901 Arenth Avenue, City of Industry, CA 91748.

CIRCLE NO. 3 READERS SERVICE PAGE

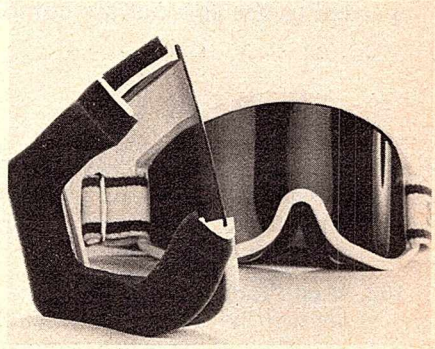
Universal Throttle Cables: Superstar Products has developed a clever but simple series of universal throttle cables which have a one-year guarantee. In place of a sheathed metal coil for the outer housing, Superstar uses a special plastic cover that can be trimmed with a pocket knife to any length. The all-plastic outer housing also eliminates the metal-to-metal friction of ordinary cables. Their



model 4000 fits more than 110 motorcycle models; model 4001 is for most minibikes; and model 4002 is a longer, unsoldered version with various end fittings for custom applications. The cables have a six-inch outer heat-shield, and an inner stainless cable with brass and plated fittings. Cost is $3.95 from dealers. Information available from Superstar Products, 217 Commercial, Garland TX 75040.

CIRCLE NO. 4 READERS SERVICE PAGE

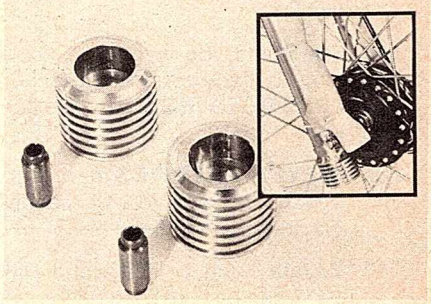
Smith Goggles: All off-road riders and racers will like several features of the Smith Moto-Sport Goggle. The construction gives great peripheral vision, and the frame design makes lens replacement easy. A generous amount of foam lines the frame, and this produces adequate



internal air flow. And the air entering the goggle has had dust and moisture filtered out. Lens tints come in clear, yellow, green, polarized and polarized yellow. Smith Moto-Sport Goggles, 3001 Redhill Ave., Bldg. 4, Suite 109, Costa Mesa, CA. 92626 can provide further information.

CIRCLE NO. 5 READERS SERVICE PAGE

More Fork Travel: The Flying Machine Factory, specialists in Honda Elsinore motocross performance, has a novel method for extending fork travel of the CR 125. Fork travel is increased to 7⅞ inches by installing lower slider caps and longer damper rods. The lower slider caps increase oil capacity and permit longer damper rods to fit into the fork legs. This in turn produces greater travel without



reducing the amount of stanchion engagement in the slider; consequently fork rigidity is maintained. All work is done by FMF. Send them your money ($64.95), sliders and damper rods, and they will machine and heli-arc the stock parts. Contact Flying Machine Factory, 1416 W. 259th St., Harbor City, CA 90710. ◉

CIRCLE NO. 6 READERS SERVICE PAGE

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When your taste grows up, so should your cigarette.
Winston
What you want from a cigarette changes.
Once I smoked just to be like everybody else. Now I know what smoking's all about. I smoke for taste.
And Winston's real taste is what I want.
Winston is for real.
Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.
19 mg. "tar", 1.3 mg. nicotine av. per cigarette, FTC Report APR. '76.

KZ-750.
Because going somewhere isn't why you ride. Riding is why you go.

If you were born with whiteline fever—if your idea of a pleasant weekend jaunt is 400 miles of twisty back road and back again; then our KZ-750 four stroke is your kind of motorcycle.

It's a classically lean, long-legged vertical twin, but with special countra-rotating balance weights in the engine to cancel out the vibrations that vertical twin lovers used to accept as being simply a part of life.

The bore and stroke are square, 78 mm each way, providing tons of torque and the ability to cruise along all day at highway speeds without breathing hard. The powerband is so wide that you won't need to spend much time wiggling the gearshift lever, either. And the KZ-750 only weighs 481 lbs. dry which makes it a very responsive handler, as you'll know by the way it has of leading you, as if by fate, to the twistiest two lane blacktop in the state.

Kawasaki

We know why you ride.

CIRCLE NO. 28 ON READER SERVICE PAGE.

KAWASAKI BELIEVES IN RIDING SAFELY. CHECK LOCAL LAWS BEFORE YOU RIDE.